# RHEUMATOID ARTHRITIS

## WITH SPECIAL REFERENCE TO

## ITS ETIOLOGY AND REMARKS ON TREATMENT

Thesis submitted for the

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by

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# INTRODUCTION

Rheumatoid Arthritis, or Arthritis Deformans may to-day be defined as a disease of the joints of doubtful etiology characterised by changes in the synovial membranes, cartilage and peri-articular structures and in some cases by atrophic and hypertrophic changes in the bone with a tendency to a chronic course usually. As a disease of great antiquity, in the early days, it probably included almost every joint disease that was then known. Until recent times it was long believed to be intimately connected or associated with gout or rheumatism. This association has been disproved by the work of Strangeways of Cambridge and some American orthopedic surgeons (Bradford, Goldthwaite and Lovett of Boston). Through them and others a more accurate knowledge of the anatomical and clinical forms of the disease has been obtained. Classification is difficult owing to a want of accurate knowledge of the etiology of the disease and whether or not more than one disease is really included in the term Rheumatoid Arthritis. Other names have been given to this disease such as Rheumatic Gout, Chronic Rheumatic Arthritis, Rheumatic Arthritis, Osteo-Arthritis and Nodose Rheumatism. Many believe that two or more different diseases are included under the term Rheumatoid

Arthritis and there is sufficient variety among the cases to account for this view. The question whether such differences are due to differences in the age of the patient or his tissues, in the structures primarily involved, in the nature of the infection, when it is an infection or in the pathological process itself, is still to be solved. Those who hold the view that there are two distinct diseases consider that in one disease the synovial membranes and the periarticular tissues are particularly affected - Rheumatoid Arthritis, and in other disease cartilage and bone - Osteo-Arthritis.

The disease is a frequent one, and common in industrial areas, where there is overcrowding in poor dwellings, old and damp, and where there is fairly often irregularity of work, with the accompanying periods of under nourishment among the people. The part played by focal infection in the causation of the disease has now been well established. The conditions mentioned above cause many other conditions such as bad health, diseased tonsils, and derangement of the intestinal or genito-urinary tract, all important sites of infection. Careful investigation of cases of ordinary rheumatism as well as of Rheumatoid Arthritis give convincing evidence that they are the sequelae very often of decayed teeth, enlarged tonsils, chronic indigestion and very often from infection of the nasal sinus, middle ear, the gall bladder and even the bronchial tubes.

## HISTORY AND CLASSIFICATION

Chronic Arthritis is a very ancient disease. Even among the bones discovered of prehistoric animals changes have been observed closely resembling the changes found in the bones and joints of human beings who suffered from this disease. The oldest phase of medicine known to us is that of Ancient Egypt. Our main sources of Egyptian medicine are from the medical papyri. One of the most important of the medical papyri is that obtained by Ebers of Thebes in 1872 which dates back to about 1550 B.C. In it Arthritis Deformans is specified as "hardening in the limbs" with prescriptions "to make the joints limber".[17] It must have been a disease of great frequency as shown by the number of Egyptian mummies depicting the results of the disease which was probably due to exposure or damp during the inundations of the Nile. Bones showing typical change have been found in Egypt by W. Pay May,[32] and in Gurot, Lower Egypt by W. Flinders Petrie.[39] Other bones found were, those in Egypt by Mr. Gore,[24] probably or the Ptolemaic period, those in Pompeii Delia Chiaje, in Pomerania by Virchow, at Southfield by Dr. Norman Moore, and in the catacombs of Paris by Lebert. Hippocrates recognised without differentiation both Gout and Arthritis in 350 B.C. but the term Gout appears to have been first introduced

into medicine by Radulfs towards the end of the 13th Century, Archaeus a contemporary of Galen in the latter half of the Christian era classed all affections as Arthritis, and little alteration was made until the 17th Century. Guillaume de Baillon (1538-1616) a Paris graduate of 1570 and employed by Henry IV seems to have been the first to use the word "Rheumatism".[45] Charcot gave him the credit of first pointing out that "Rheumatism" was not simply a form of gout but was an entirely different disease. Sydenham in 1683 went a step further and pointed out that chronic rheumatism was not rheumatic gout but should be considered to be a separate disease quite as much as Rheumatic Fever. There seems to have been very little advance in the knowledge and treatment of Rheumatoid Arthritis up to the 18th Century, but it is interesting to note that then a clinical teacher of the name of William Cullen (1712-90) differentiated 34 varieties of chronic rheumatism and introduced hydrotherapy with quick changes of temperature which Despars of Aix les Bains called the "Scotch Douche" (1760). About the same period William Heberden (1710-1801) was practising and he was the first to describe the nodules on the fingers which occur in Arthritis Deformans, and to this day called Heberdens nodes. In a monograph in the "Clinical History of the Nodosity of Joints" published in 1805, John Haygarth noticed

in "thirty-four out of 10549 patients" a "peculiar and troublesome disease of the joints of a peculiar nature and clearly distinguished from all others by symptoms manifestly different from gout and from both acute and chronic rheumatism". He called attention to the nodosities on the terminal finger joints which had been described by Heberden in 1782. He recognised the slowly progressive polyarticlar nature of the disease with a preference for the hands and knees. He also observed that it occurred most commonly between 50 and 60 years of age and that women were more susceptible to it about the time of the menopause. In 1857 Robert Adams of Dublin[2] proposed the first clear cut separation of chronic rheumatism with two types the "polyarticula" and the "monarticula". It is, of course, now known that both types are polyarticula. The next important terminology which appears is that of Garrod in 1857[20] who called chronic articular rheumatism "rheumatic arthritis". His son, A. E. Garrod[18] differentiated the type still further into "rheumatoid arthritis" subdivided into Acute and Chronic, including the juvenile chronic arthritis described by Still (Still's Disease) under this heading, and "Osteo Arthritis"; Bannatyne in 1896[4] also recognising two main types included them both under "rheumatoid arthritis" calling one "early rheumatoid" and the other "late rheumatoid". Goldthwaite in 1904[22] interested in Chronic

Arthritis became convinced of the existence of three main types of chronic Rheumatic Arthritis, after careful study of a large number of cases. He recognised one type sometimes rather acute in onset but running a chronic course which followed a known infection. This he called "infectious arthritis" such as "gonorrheal infection" and the "chronic arthritis" which commonly follows dysentery. His second type was not associated with any known infection which bore an obviously causal relation to it. It was most frequently seen in poorly nourished women and more rarely in men. In this type a constant early characteristic was noticed, namely an atrophy of the bone structure and eventually an atrophy or active erosion of the cartilage and underlying bone ends. He called this second type "atrophic arthritis". The third type seemed to have little in common with the first two types either in incidence, onset, course or pathology and was identical with the "monarticula" type of Adams, the Osteo-arthritis of Garrod and Bannatyne's "late rheumatoid arthritis". It attacked individuals of both sexes late in life who seemed otherwise in good health and who, as a rule, were well nourished. Superficial joints like the terminal joints of fingers showed the swellings characteristic of Heberdens nodes. The deep joints early in the course of the disease showed nothing to inspection, even if they were involved.

X-Rays, however, almost constantly and often before the subjective symptoms appeared in the given joints, revealed little sharpenings of articular margins and calcified spicules at the edges of the joint at the junction of the articular cartilage and bone. (Vide X-Ray film Case 15.) As the disease progressed, these spicules became spurs, the articular surfaces became notched and mis-shapen, the joint space narrowed and masses of calcified material could be seen in X-Ray plates attached to the articular margins of the body. Hypertrophy of bone seemed to be the early outstanding characteristic which continued throughout the activity of the disease. This type Goldthwaite called the "hypertrophic arthritis". Robert Hutchison[31] went further and classified them as follows:-

1. An atrophic form in which there is no overgrowth of the ends of the bones. (Rheumatoid Arthritis.)

2. A hypertrophic form in which the changes begin in the bone and destruction of it is continued with new formation and overgrowth (Osteo-arthritis). Whether these two conditions should be regarded as separate diseases or different stages in the one disease is not yet established. The Osteo-arthritis type is generally chronic and the Rheumatoid type may be acute, subacute, or chronic, but sometimes both types appear to be present together.

Many are the objections which have been raised against the various titles given to this condition,

"Rheumatoid", which simply means "like rheumatism" and is objected to on the ground that it allies the condition to rheumatism. It must, however, be regarded as merely denoting the outward resemblance that this condition frequently bears to rheumatism. New terminology is at present undesirable as the etiology is still uncertain and it would only add to the confusion already existing. For the purpose of this thesis, I adopt this classification.

During thirty-eight years practice in a large colliery and industrial area, I have seen and treated with varying success, many cases of this disease among a class of people who live under very adverse circumstances. I hope to show all the phases of the disease in the cases that I am presenting. Economically situated as they are, very few cases here have much opportunity of Hospital treatment and if they do, it is only for a period of two or three weeks at a stretch. It is therefore essential in these circumstances that an early and accurate diagnosis from the other conditions generally included under the term rheumatism should be made for the immediate and correct treatment of the patient.

Rheumatoid Arthritis.

The onset of Rheumatoid Arthritis is frequently sub-acute, but it may be acute or chronic. It usually pursues an insidious course, affecting as a rule the metacarpo-phalangeal and inter-phalangeal joints first. The ligaments and capsule of the joint are thickened and it may contain synovial fluid in excess. The articular cartilages may be damaged by pressure, but there is little tendency toward the formation of osteoaphytes. As the disease slowly progresses, the middle sized and larger joints become involved. Often the condition is more or

less symmetrical. The joints may be red and tender, movement is much impaired, and the swelling is frequently fusiform. On passive movement grating and clicking sounds may be heard. The muscles of the affected joints rapidly atrophy and contractions and deformities ensue. The hand is frequently deflected to the ulnar side and the inter-phalangeal joints are flexed. Much crippling and disability is present. Anaemia and pigmentation of the skin are often found. Vide photographs of the cases presented.

Osteo-Arthritis.

Under this heading are included certain localised forms of arthritis and a generalised Osteo-arthritis. In this condition the cartilages, bones and synovial membranes present well marked changes. Enlargement of the synovial fringes takes place and these may become ossified. The articular cartilages assume a soft and velvety appearance, become worn away and expose the ends of the bones, which later become hard and eburnated. Deformities and contractions follow and the joints present a hard and angular appearance. Heberdens nodes are sometimes present. The localised type is often found in the metacarpal joint of the thumbs, the tempero-maxillary joint or the knee-joint, but it is most frequently found in the hip joint

maleum coxal senile. The generalised type is somewhat similar to Rheumatoid Arthritis but the deformities are irregular and angular instead of fusiform. Frequently it is impossible to draw a hard and fast line and sometimes the conditions appear to overlap. There is a form of Osteo-arthritis which involves the inter-vertebral discs with lipping of the edges of the vertebral bodies. This is called spondilitis deformans.

Another type involves the small joints of the articular processes of the vertebra. This is termed Spondylitis chronica anrylopoietica. Two types are described:-

1. Morie Strumpell type, where the conditions commence below and spread upward and where the hips and shoulders are also affected.
2. Bechterew type with kyphosis of the dorsal spine and where the condition spreads downwards.

Having thus briefly described the salient features of the condition under consideration, I now wish briefly to distinguish the conditions with which it may be confused, and from which it must be differentiated. These include:-

1. Acute and Subacute Rheumatism.
2. Chronic Rheumatism.
3. Gout.
4. Gonorrheal arthritis.

5. Tabetic Arthropathy. (Charcot's disease.)

6. Syringomyelia.

7. Pulmonary hypertrophic Osteo-arthropathy.

8. Tuberculosis of hip or sacro-iliac joints.

9. Sub-deltoid bursitis.

It is probably only in the early stages of an attack of acute Rheumatoid Arthritis that the likelihood of its being mistaken for acute rheumatism exists; later, however, it might be mistaken for subacute rheumatism.

In acute rheumatism the temperature is invariably higher, often ranging from 102° F. to 104° F. There is frequently a sour smelling perspiration extending over the whole body. In Rheumatoid Arthritis the perspiration is cold and usually confined to the soles of the feet and the palms of the hands. In Rheumatoid Arthritis the pulse is rapid in relation to the temperature as compared with acute rheumatism. The rapidity frequently persists after the temperature has subsided. Cardiac complications are so frequent in acute rheumatism as almost to be regarded as a symptom of the disease. It is a relatively infrequent complication of Rheumatoid Arthritis. Acute rheumatism always responds to treatment by Sodium Salicylate. Rheumatoid Arthritis does not. In acute rheumatism there is no hypertrophy of the bones or ligaments. It affects only the fibrous tissues and is marked by great synovial

distension, pain and heat. The affection of the joints is more or less transitory, flitting about from joint to joint and it is frequently the larger joints that are affected. The cervical and tempero-maxillary joints are not affected, and the symmetry so often seen in Rheumatoid Arthritis is usually absent. Pigmentation and freckly appearance of the skin is frequent in Rheumatoid Arthritis and certain sensory phenomena as "pins and needles" also occur.

Chronic Rheumatism.

Chronic rheumatism is "a very chronic affection", occurring chiefly at and after middle life, and characterised by stiffness and sometimes swelling of joints and by pain which is often aggravated in cold weather.[35] It has been doubted by some whether there is such a condition while many and varying aches and pains have been summed up by others as such. Still the condition described above is that for which the term "chronic rheumatism" should be kept. Such cases are frequently met in practice, and have to be distinguished from Rheumatoid Arthritis, but it is generally very easy to do so. There is an absence of deformity and crippling.

Gonorrheal Rheumatism and Arthritis.

This condition generally follows on an urethritis

but may commence at any stage of the infection. It may affect several joints symmetrically, but it is most often confined to one large joint; the knee, the ankle and wrist joints being particularly susceptible. The joint is painful, tender and swollen and there is effusion in and around the joint. Permanent stiffness and ankylosis may ensue. In the absence of a history, the diagnosis is sometimes difficult and if the tempero-maxillary joint is affected, and it may be, there is liability of a mistaken diagnosis. In the absence of treatment, there is a tendency for a persistence of the symptoms in the particular joint or joints affected. There is frequently some pyrexia, and the affection is common in males. The gonococcus may be present in the synovial fringes and has been cultivated from the fluid withdrawn from the joint. The condition generally yields to appropriate treatment.

Gout. (Podagra.)

Gout affects chiefly middle aged and advanced males. A straightforward case of acute gout presents no difficulty in diagnosis. The history frequently is an hereditary one, good-living and lack of exercise all point a finger in the direction of the diagnosis and often may be sufficient in themselves to justify it. In the more chronic cases where "tophi" are present and the joint is red and dusky, the diagnosis still presents no

difficulty. It is the recurrent attacks of chronic gout which are liable to be mistaken for Rheumatoid Arthritis. Urates are deposited first in the articular cartilage and then in the ligaments and capsular tissues so that eventually the joints become swollen, irregular and deformed. The small joints of the toes and fingers are affected most. At a later stage the wrists, ankles, elbows and knees may be affected and deformities and fixation of the joints ensue. It will be seen that this picture closely resembles that of Rheumatoid Arthritis. With X-Ray plates, however, deposits of urate of soda may be distinguished as dark spots around or in the joint, and many constitutional and other symptoms are present in this condition which may be absent in Rheumatoid Arthritis. These include dyspepsia, increase in pulse tension, arterio sclerosis and hypertrophy of the left verticle. Chronic interotitial nephritis is a frequent complication and albumin is present in the urine, which has a low specific gravity and contains a few hyaline casts. During the intervals of the paroxysm, it is much increased. Uric acid is also present in the blood and may be recognised (Garrod's Test). Charcots joints which sometimes complicate tabes dorsalis, may assume one of three forms:-

1. Enlargement of the capsule, thickening of the synovial membrane and an increase of fluid.
2. Slight enlargement of the ends of the bones.

3. The cartilages become velvety and atrophy in places. The knees are most frequently involved but the spine may also be affected.

There are, however, so many definite sensory phenomena in tabes, that a mistake in diagnosis as regards Rheumatoid Arthritis is unlikely.

The arthropathies which occur in 10% of cases of Syringomyelia must be remembered, but here again we have very definite sensory phenomena. In hypertrophic pulmonary osteo-arthropathy the changes come on gradually, the hands are enlarged, the terminal phalanges much swollen and the nails become large and curved. Similar changes affect the feet and the bones of the forearm and legs become greatly enlarged. Eventually there is little difficulty in diagnosis.

The more articular forms of Osteo-arthritis have to be distinguished from tuberculosis of the hip and sacro iliac joints. Tuberculosis of the joints invariably occurs in younger subjects and there may be constitutional symptoms or a history to point to the disease. It is sometimes difficult to distinguish an old standing tuberculosis of the hip from an Osteo-arthritis. A sub-deltoid bursitis may give rise to symptoms similar to Osteo-arthritis of the shoulder.

It will be seen from the foregoing summary that there are several conditions which present a clinical feature

somewhat similar to Rheumatoid Arthritis, but that in most cases the diagnosis should be favourable, as Rheumatoid Arthritis presents several very definite distinguishing clinical features.

## ETIOLOGY

There are two theories of the cause of this disease.

1. That it is infective.
2. That is is due to disordered metabolism.

### 1. Infective Origin.

In the early days of Bacteriology when the causative bacteria of various diseases were first discovered, numerous acute diseases were found to be due to bacterial infections and the bacteria appropriately received names associating them with the disease. In some instances the first organism obtained from a disease did not conform to Koch's postulates and further research led to the discovery of other germs whose causal relationship with the disease was finally proved. Koch's postulates are satisfied in the majority of infective diseases, but it has been found that some pathogenic micro-organisms which are undoubtedly capable of producing disease may also exist in a non-pathogenic form in the tissues of animals, including man, without symptoms of disease resulting from their presence. Further a number of pathogenic species are known to be carried in the tissues or body cavities of man, without giving rise to symptoms of disease in their host and yet when the organisms are obtained in

culture in the laboratory, inoculation into animals proves that they are possessed of a considerable degree of virulence. These organisms play a great rôle in the production of epidemic disease, the healthy or unsusceptible person transmitting the organism to the susceptible in whom disease is produced. The histories of diphtheria, cerebro-spinal meningitis, and many other epidemics are instances of what Hueppi[30] has termed "oecoparasites". Besides disease of a more specific nature such as diphtheria, in which the symptoms are caused by the poison or toxin of the organism, there are diseases due to bacterial invasion of the tissues which may be caused by several different types of bacteria - thus the first bacteriological investigations in pneumonia, the Friedlander bacillus was thought to be the cause and was termed by its discoverer the "pneumobacillus". Later investigation showed that the pneumococcus of Frankel was the specific agent in the production of croupous or lobar pneumonia. In later times it was found that the symptoms of pneumonia may be caused by a variety of organisms amongst others the streptococcus, the influenza bacillus of Pfeiffer, as well as the bacillus of Friedlander. A large variety of bacteria can give rise to disease symptoms which are indistinguishable in tissue reaction and clinical effect - the inflammatory reactions are alike - thus the reaction

to the injurious agent, as it is termed, induced by the streptococcus, staphylococcus, bacilli coli and other pus forming bacteria, is often histologically and physiologically identical. Further it is found that bacteria of the streptococcal and staphlococcal group show considerable variation in their powers of infectivity - thus the staphylococcus aureus may give rise to such diverse conditions as a simple facial pimple, a carbuncle, osteomyelitis or acute phlegmonous inflammation commencing in the face and producing death within a few hours. The streptococcus group are constantly present in the normal human mouth and yet varieties of the streptococcus are identified as the cause of acute erysipelatous inflammation, of septicaemia, pyaemia, infective endocarditis and acute infections of a similar character. There was, therefore, a considerable amount of ground for Hueppi's objection to the term "specific bacteria", that is to say the special association of individual species of bacteria with specific forms of disease. The defensive reaction of the body to an infective process originates in the fixed and wandering tissue cells, a localised increase in certain cells immediately follows bacterial invasion and later a general increase of the white cells of the blood, leucocytes, demonstrates the widespread cellular defence of the tissues to microbic infection. Metchnikoff's

brilliant work[33] on the subject laid the foundation of our present knowledge of the body mechanism of defence against bacterial infection.

In the early days of bacteriological work, the attention of medical men was focused on acute diseases associated with bacterial infection, but when it was demonstrated that bacteria could be found in all cavities of the healthy body and that micro-organisms are normal inhabitants of the mouth and intestines, the possibility that such harmless bacteria could produce disease was laughed at. Much controversy has raged round the question of chronic infections but as time has gone on, it has been found that many species of bacteria, are all capable of remaining in the tissues long after the symptoms of the original infection has passed away, from time to time becoming aroused from their quiescence, taking on fresh activity, as the agents of localised or generalised disease, and that even the normal inhabitants of intestines or mouth may invade the tissues and engender disease, as for instance B. Coli and streptococcus faecalis. The micrococcus gonorrhea, which was early recognised as the infecting agent of gonorrheal infection, has been found to be capable of lying latent for many years and with no subsequent history of fresh infection - has been known to cause disease in the individual harbouring the micro-

coccus. It has also been known that in infected wounds of the Great War streptococci and anaerobic bacilli have been found lying latent in the tissues for long periods after the original wound was healed. This has been demonstrated to me at the Ministry of Pensions Clinics in South Wales, as one of the Ministry's Medical Referees. Further, it is well known largely by experience of the Great War, but pointed out by Adami[1] and later by Pemberton, 1935, [38] that latent infection was a fact that must not be lost sight of, as a sequela of all infected processes. It has been demonstrated over and over again that a healed wound or a quiescent joint, which receives a subsequent injury long after the original wound has healed, is liable to sudden exacerbation of inflammation, pus formation and generalised infection; even death may result from such a cause. Finally, absorption and destruction of bacteria is a daily and hourly circumstance in the skin and mucous membranes; such organisms as are not destroyed by the tissue cells or phagocytes are eliminated sporadically through the kidneys and liver. This process, termed by Adami subinfection, no doubt plays an important part in the etiology of such diseases as chronic muscular rheumatism, fibrositis and especially monarticular infective arthritis. The importance of tracts or foci of chronic or indolent inflammation

depends on another factor, for in addition to opportunities for massage subinfection, the organisms living in the suppurating or merely inflamed tissues are gradually acclimatised to residence in the tissues of their host, and much evidence is extant that gradual increase in the properties of virulence and infectivity ensue, and that if some general decrease in vitality of the body should be induced, the septic focus soon operates as a centre of active disease production.

There is another side to the problem of latent and chronic persistent infection, the same clinical symptoms may be produced by several types of organisms which are dissimilar both by their morphology and biology - but we have another possibility, namely that the combination of certain organisms may produce symptoms which are unlike those produced by either of the two parties of the symbiosis. Symbiosis is the combined activity of two or more organisms, one assisting by the growth of the other and many instances of the curious association of bacterial growth might be adduced. Two especially have accurred during the War-association of pus cocci with the bacillus of tetanus, and the bacillus Welchii with bacillus sporogenes (non-pathogenic without the bacillus Welchii) the combination producing symptoms of acute gas gangrene. Another term is sometimes applied to the combined activity

of bacteria, namely metabiosis, which denote the following up of the activity of one organism by the growth of another. This is not so well established in pathogenic bacteriology, as in the natural processes of destruction of organic material in nature by the various putrefactive micro-organisms, although the common putrefactive train, carbohydrate fermentation, alcholic fermentation, acetic fermentation, putrefactives are of considerable importance in many forms of gastro-intestinal disease.

The foregoing facts outline a few of the problems of bacterial infection which can be applied to disease of gums, teeth and oral mucous membranes. Having in mind, therefore, the facts that organisms exist in the body without producing symptoms of disease and that the inter-relationship between the body resistance and bacterial infection is an extremely difficult problem, we must approach the question of chronic mouth infections and their rôle as the existing cause of remote disease with a critical mind. Further it may assist in a proper recognition of the problem if we envisage it as one not unallied with certain physical phenomena, a chronic suppurative process may be a localised phase in which the infectivity of the bacteria and the power of resistance of the tissues are in equilibrium. So long as this equilibrium is maintained, there will be no developement of

general infection or of symptoms of disease in other parts of the body. Should, however, the activity of the bacteria become enhanced or the resistance of the tissues depressed by any subsidiary cause, the balance is altered in favour of the bacteria. Now we come to the question of focal infection. This expression has come into general use to indicate an area of bacterial activity from which bacteria and their products are slowly and insidiously absorbed; the actual focus itself may give no clinical symptoms or at the most, signs so insignificant and evanescent that their importance is masked by the secondary effects induced by the bacterial absorption, e.g. the general septic appearance of a patient with one or more tooth stumps the centre of tiny abscesses in the gums giving no symptoms of pain or discomfort locally, the tooth stumps being left behind when all the teeth were supposed to be extracted and shown up by X-Rays. It is alleged upon considerable evidence both clinical and experimental, that the sequestered bacteria flourishing in a 'focus' become increased in virulence by their long comtinued adaptation in growth in parasitic conditions - the tissues in the immediate vicinity of the focus become less and less resistant, so that the bacterial infection spreads insidiously and increases the volume of infection, chronic blood poisoning, chronic endocarditis,

affections of the skin such as urticaria, iritis and chronic interstitial nephritis. Focal infections may exist in many parts of the body, but certain systems are more prone to this insidious accident than others - thus the genito-urinary tract of both male and female, the gastro-intestinal tract, and the upper air passages, are especially the site of focal infections. Especially have the gums and teeth become notorious, thus chronic alveolar abscess, perapical infection and suppurative periodontitis, particularly when progressing to alveolar osteitis, which must always be eliminated in the differential diagnosis of a cryptic infection. It is true that the co-relation of the micro-organism in the infected focus with the remote symptoms is not always easy, at the same time the gradual deterioration in the organ continually subjected to mild but frequent doses of poisonous substances, must finally materially affect the general body metabolism although the actual pathogenicity of the micro-organism is of a low grade when tested by the criterion of injection into laboratory animals. The clinical picture of gradual deterioration of health following a long continued infection of the intestinal tract is of every day experience, and yet no infecting bacteria, remotely fulfilling Koch's postulates, are demonstrable, although the blood of such persons may

exhibit agglutination and precipitation phenomena which are absent in the normal individual. It follows that infection as the cause of remote disease symptoms is a matter of the greatest difficulty. Diphtheria and tetanus are the two organisms well known to produce their effects at a distance. Diphtheria bacilli reside in the throat only, but cause toxic myocarditis. Tetanus grows only in the muscle but its toxins absorbed, caused lesions in the central nervous system. Streptococci in scarlet fever live in the throat where they produce a toxin which causes at any rate part of the disease, but it is probably an intermittent septicaemia that produces endocarditis and acute nephritis. The question of chronic distant affections being produced by a collection of streptococci of low virulence residing in a closed focus, is more difficult of proof. The first point in the argument is that these normally lowly virulent organisms are absorbable because streptococci salivarius has been found to be the cause of acute septicaemia. Secondly, although it seems impossible to isolate them from the joints, yet in some cases of arthritis we do find the same variety of streptococci in the urine as are in the septic focus, showing that they are being absorbed into the blood stream. Thirdly, comparable to the effect of injecting tuberculin into a tuberculous subject, it is possible to

get diagnostic local, focal and general reaction in the patient by the injection of a vaccine of organisms isolated from a focus, such as teeth nasal sinuses and so on. Fourthly, surgical interference with such a focus often leads to an acute exacerbation of the distant lesions and relapses in the focal infection are often accompanied by recurrence of the remote disease. Finally the therapeutic test may be adduced - if the right focus is found, rational treatment usually results at any rate in arrest of the general disease. The use of an antigen prepared from the proved causative organisms, firstly to prevent a flare up which may follow surgical treatment of the focus and afterwards to provoke an immunity response, nearly always results in a cure.

To summarise the evidence in favour of focal infection - oral focal infection is one of the best fields for the investigation in the elucidation of the problem of gradual lowered resistance and the induction of remote disease through bacterial invasion and presents fewer obstacles to research than most other regions of the body. Up to the present time the organisms responsible for the symptoms of disease from mouth infection, belong to the streptoccal group although it is more than probable that certain bacteria such as bacillus fusiformis are also active. Streptococci viridans, streptococci non-hemolyticus

and streptococci hemolyticus appear now to be the leading organism found.[38] Whatever may be the exact mechanism of infection or what actually determines the production of symptoms, there is overwhelming evidence that diseases of many varieties or better, disease symptoms of many kinds, are directly referable to the unhealthy state of the oral mucous membranes.

The symptoms will depend somewhat upon the portal by which the bacteria or their products enter the body.

The channels through which oral infection may take place are:-

1. The gastro-intestinal, through swallowed bacteria or their products.
2. The blood stream, by direct infection, by organisms or their products, which may be carried to distant parts of the body. Under this heading should be included infection taking place through lymphatic channels.
3. The spread of organisms by continuity of tissues into the respiratory tract, either upper or lower air passages and nasal sinuses.

1. Gastro-intestinal. It is often maintained that direct interference with the digestion may take place through mechanical defects in masticating food, the food swallowed consisting of large pieces. Most physicians are familiar with cases of gastro-intestinal fermentation whose dyspepsia disappeared with the extraction of the

septic dentures long before the patient has had dentures. In these cases, however well the food has been cut up, it still reaches the stomach in relatively large pieces, but the removal of the constant source of bacteria and their products has allowed the natural defensive processes of the stomach to come into play. The mechanical side has been hardly operative. Infection of the stomach with bacteria already acclimatised to residence in the body through suppurative periodontitis makes up a large portion of the cases of gastric disturbance due to oral sepsis. Cultures from a dyspeptic stomach show numerous organisms of mouth origin, excess of lactic acid is found, and in the specimens obtained, mouth organisms are easily recognisable, i.e. the ordinary mouth streptococcus, spirochaetes, and the rod forms and fragments of the leptothrix racemosa of Vicentine. Gradual degeneration of the digestive function from persistent lactic acid fermentation is followed by actual infection of the gastric wall.

2. Infection of the Blood Stream direct by organisms in diseased gums, alveolar bone, perapical abscesses, and possibly even infected tooth pulps as suggested by Rosenow,[42] is probably the chief road by which bacteria are disseminated from the mouth to set up disease in other parts of the body. It is possible that the ingestion of

bacterial products via the gastro-intestinal canal may diminish the general resistance of the body towards organisms, and so render the gastro-intestinal canal liable to infection by organisms of mouth origin, circulating in the blood. Adami[1] has named the constant absorption of bacteria taking place from the intestine and other parts of the body, "subinfection". Subinfection probably leads, in some instances, to real infection of parts already lowered in resistance, and in this way joints may become infected through the blood stream. The activities of the liver and pancreas are commonly decreased in the presence of oral infections and it is possible that the function of these organs may be affected by the double attack-blood stream and gastro-intestinal canal. Such a consideration is no doubt theoretical, but there are many practical and clinical facts which tend to support the assumption.

The foci of infection of the mouth fall into two kinds essentially dissimilar both in pathology and infectivity:-

a. Infective foci at the roots of the teeth due to disease and death of the tooth pulp, periapical abscess, chronic alveolar tooth abscesses and infective granuloma.

b. Infective foci in the gums and alveolar process commonly affecting the sockets of the teeth with living pulp, i.e. alveolar abscesses, chronic suppurative periodontitis, rarefying and sclerosing osteitis.

Periapical infections are usually associated with the more severe constitutional diseases, endocarditis, pericarditis or myocarditis, eye affections, and the more serious affections generally. Suppurative periodontitis is more commonly the exciting cause of chronic affection especially arthritis. There is direct evidence that mouth bacteria affect remote regions of the body and the demonstration of mouth in the urine, faeces and occasionally the blood, proves that mouth organisms can and do enter the blood stream and set up disease. Horder[29] isolated streptococci of the salivarius type in six out of eight cases of chronic infective endocarditis. Later observers have confirmed this, such as Crowe[12] and Pemberton.[38]

3. <u>The Spread of Infection by Continuity of Tissue</u> is seen in the various affections of an acute character- erysipelas and diphtheria. During inflammation affecting the mouth, the organisms may be demonstrated in the nasal passages and vice versa. The spread of catarrhal inflammation from the nose into the respiratory tract is too common an observation to warrant any further mention and it is a simple matter for bacteria inhabiting the mouth to enter the respiratory passages - in fact in chronic affections of the lung, especially bronchiectasis and chronic bronchitis, mouth bacteria such as mouth spirochaete as well as the cocci and bacilli of the mouth, are found

in specimens of sputum obtained without contamination with the saliva or oral secretions. Mouth bacteria may have been demonstrated in lesions far removed from the mouth, but the products of mouth bacteria or their toxins have not so far been identified as giving rise to disease. It is, however, conceivable that such diseases do exist, but exact proof is wanting. A very good deal of evidence on the inter-relationship of oral infections and disease in other regions comes to be based upon clinical observation that disease symptoms become ameliorated when the state of the mouth has undergone improvement.

It is generally admitted that the articular system is frequently affected by mouth infections and an examination of the mouth is now part of the usual routine in any case exhibiting swelling of joints. Goadby[21] describes experiments on rabbits when arthritis was produced by the inoculation of pure cultures of certain bacteria of the streptococcal group, and the association of mouth disease and rheumatic symptoms, were established. Cultures of organisms produced from suppurative periodontitis and apical infection when injected into rabbits "produced not only perarticular thickening but the characteristic changes in the bony tissue, not only osteoporosis but lipping and osteopathic outgrowths, the whole appearance being that of a chronic hyperthrophic arthritis".

Subsequent to these observations various American observers have investigated the effect of injecting of animals with streptococci obtained from the mouth.[34] Beattie[6] has done a great deal of work also in the production of arthritis in rabbits, and claims to have succeeded with quite small numbers of microbes, thus meeting the criticism of many observers that large masses have to be introduced before the effect is obtained. In America, Nathan[37] has done many experiments on dogs with like results and Rosenow[43] has gone so far as to say that if a streptococcus isolated from an infective focus such as a tooth, is injected into a rabbit, then whatever other lesion that streptococcus produced in the man, the same lesion will be produced in the rabbit. Topley and Weir[47] have a well reasoned discussion at the conclusion of their published report of an experimental investigation into the question. They sum up in favour of the view that results from direct injection of streptococci into animals are distinctly in favour of the hypothesis that streptococci are the cause of Rheumatoid Arthritis. An extremely significant thing they record is that not only streptococci isolated from acute rheumatism, but streptococci from various sources, if injected into rabbits can produce arthritis.

There are many who argue against the theory of focal infection. It has naturally been urged that

extensive infection, especially oral, may exist for a long time without the sequence of Rheumatoid Arthritis or other systemic lesions, and it must be admitted that few persons of mature years are entirely free from chronic septic foci. Further it has been insisted that in many cases of Rheumatoid Arthritis, careful search fails to reveal a septic focus. In considering why very definite focal infection often fails to cause joint disease, the constitution of the individual, his powers of resistance must be taken into account. Cases certainly occur in which a focal infection exists for years before the onset of arthritic symptoms, which may then run a rapidly progressive course, crippling the patient in a few years. Something, perhaps an attack of influenza has broken down the individual's immunity and powers of resistance, among which the bactericidal power of gastric hydrochloric acid must be taken into account, or in a more marked degree has rendered him sensitive to micro-organisms or to their products to which he was previously immune. Another example of this acquired susceptibility is provided by cases following continued stresses and trauma described by Arbuthnot Lane. It may be inherent and congenital such as the conformation of the body, and the "human constitution" which Draper[14] has recently defined as "the aggregate hereditarial characters, influenced

more or less by environment, which determines the individual's reaction, successfully or unsuccessfully to the stress of environment". It must be admitted that it is often difficult to detect the infective focus - this may depend on our imperfection in our means of localising them. Another difficulty about focal infections is that the primary one, such as dental suppuration, may produce secondary foci, some of which are less easily removed e.g. in the tonsils, cervical glands, maxillary antrum, the gall bladder, appendix, intestine, mesenteric glands or one of the several affected joints may act as a reservoir of infection. One reason for the practical failure of the focal infective theory of Rheumatoid Arthritis is perhaps imperfect removal of the whole of the focal infection. Dentists are rightly conservative in extracting teeth they believe to be sound, but even if one tooth with latent apical infection is left, this may be sufficient to keep up the joint trouble, either by serving as a continued source of bacteria conveyed by the blood or possibly by providing poisons, which, acting on a joint rendered hypersensitive by previous infection, responds actively. Even when teeth are removed, infected roots may be left behind to keep up the infection. The position is made more difficult by evidence that X-Ray examination of the jaws may fail to reveal

infection of the apices of the teeth. An object sometimes raised to the infective origin is that the average run of rheumatoid cases show little or no evidence of corresponding systemic and visceral damage. In reply it may be said that this is also true of many cases of undoubted focal infection. On the other hand, Rheumatoid Arthritis is often associated with Fibrositis and Neuritis.

2. Disordered Metabolism.

In 1907, while admitting that treatment of focal infection is sometimes followed by amelioration or even cure of the affected joint, Sir Archibald Garrod[19] doubted if these cases are really examples of the specific disease Rheumatoid Arthritis, adding, "assuming that such a disease existed". In 1923 he was of much the same opinion in opening a discussion at the Royal Society of Medicine at which Cassidy[9] expressed his firm conviction that the importance of infection had been greatly exaggerated and while granting the existence of a large group of cases of chronic infective arthritis, believed that there was also a genuine Rheumatoid Arthritis - a somewhat common disease due to disordered metabolism.

What evidence is there that disordered metabolism is the sole cause of Rheumatoid Arthritis or of a certain

group of cases? Hereditary disposition to Arthritis is not a very strong argument, for this might be regarded as an unborn want of resistance to infection. According to Pemberton,[39] the basal metabolism is lowered, and the sugar tolerance is lowered in Rheumatoid Arthritis, but it might justly be argued that this really depends on infection as it returned to normal abruptly, on removal of the focal infection. From this point of view the metabolic defect appears to be limited to the carbohydrates and might be regarded as, in common with the Arthritis, due to infection. It is impossible to deny that any inherent disorder of metabolism might favour an infective or toxic Arthritis by diminishing the resistance and that gouty deposits are found in chronic arthritic joints though they may be secondary rather than primary. On the other hand, it is known that an infection may, by inducing pancreatic disorder, lead to a more or less permanent lowering of sugar tolerance. Pemberton considers that such a permanent lowering of sugar tolerance accounts for the disappointing results of removal of the definite foci. It may, therefore, be logically argued that a lowered sugar tolerance alone may also cause Rheumatoid Arthritis. But Rheumatoid Arthritis is not a feature of diabetes mellitus, even though infections are prone to occur, so that as regards disorder

of carbo-hydrate metabolism as a primary factor in the causation of Rheumatoid Arthritis the positive evidence is very weak. Although infection may so affect the endocrine glands as to modify metabolism, and thus favour joint changes, this is very different from postulating a primary error of metabolism independent of infection.

Draper[14] argues that chronic arthritis represents a very profound disturbance in forces analogous to those concerned in acromegaly and thyroid insufficiency, and chronic Arthritis due to thyroid insufficiency and to pluriglandular inadequacy, especially ovarian, has been described - but it may be objected that chronic infection is really the underlying factor of both the endocrine and the arthritic disorder. The endocrine element in Arthritis has recently been discussed by Thompson,[46] who divides the cases of Arthritis into:-

a. Isothropic or chronic infective Arthritis, due to and curable by, removal of the infective focus and differing structurally from the two following forms.

b. Atrophic or rheumatic Arthritis occurring in individuals of the slender "carnivorous" type of Goldthwaite and Bryant,[23] and associated with, but he does not say definitely due to, some evidence of endocrine dysfunction often hyperthyroidism.

c. The hyperthropic, or osteo-arthritic of our nomenclature, attacking the "herbivorous" type of Bryant and Goldthwaite with low metabolic rate benefited by thyroid medication, and showing evidence of hyperthyroidism.

> It will at once be obvious that as Osteo-Arthritis and hyperthyroidism are both common in advanced life, their coincidence does not prove that the joint lesion is secondary to the thyroid disorder. Thompson does not prove or dogmatically claim more than that "certain types of Arthritis are not necessarily disease entities, but may be symptoms of or coincident with, an endocrine dysfunction."

Probably in many cases both causes are intermixed. The arthritic and endocrine disorders may be due to infection, or the metabolic disorders may precede and dispose to infective Arthritis.

While the foregoing notes have dealt principally with the theories as to the cause of the condition, there are certain factors which seem to play an important part and which are so constantly present as to sometimes have been cited as causal. They should probably be regarded as predisposing. They include all those causes which lower the vitality and weaken the resistance of the patient. This would seem to lend support to the infective theory.

1. Heredity.

True hereditary inheritance seldom if ever occurs and is very difficult to trace owing to the confused nomenclature and pathology - in this the condition differs from gout and rheumatism where heredity plays an important part. There are some families who appear more than

ordinarily susceptible to arthritic lesions, not necesarily all of the same type, but including gout, rheumatism, or Rheumatoid Arthritis. Bannatyne[4] taking a series of cases from the Bath Royal Mineral Water Hospital over a period of twelve years, found that only in a few could gout be clearly traced, and he put a history of direct inheritance as 5%. Direct inheritance can therefore be said to be relatively infrequent.

2. Age.

Most cases have the onset about middle age from thirty to fifty. Generally the younger the victim the more acute is the condition; the following shows the analysis of 2.930 cases by Bannatyne.

| Age at first occurrence. | Females. | Males. |
|---|---|---|
| 10 - 20 | 140 | 40 |
| 20 - 30 | 540 | 50 |
| 30 - 40 | 780 | 60 |
| 40 - 50 | 500 | 110 |
| 50 - 60 | 450 | 90 |
| 60 - over. | 110 | 40 |

An analysis of 100 cases of A. E. Garrod.

| Age of commencement. | Females. | Males. |
|---|---|---|
| 0 - 10 | 1 | 0 |
| 10 - 15 | 3 | 0 |
| 15 - 20 | 3 | 0 |
| 20 - 30 | 22 | 7 |
| 30 - 40 | 28 | 6 |
| 40 - 50 | 14 | 3 |
| 50 - 60 | 5 | 7 |
| 60 - 70 | 1 | 0 |

It will be noticed from the above tables that

women appear particularly liable to this condition about the occurence of the climacteric. After this there is a quick fall in the number of cases.

3. Sex.

It is well known that the disease is much more prevalent in women than in men. The foregoing tables show this amply. It may be mentioned that gout affects men more than women, while rheumatism is more evenly divided among the two sexes. The reason for the prevalence of this disease in the female sex seems to lie in the fact that they are more liable to debilitating causes which are predisposing. Menstrual disorders are very common in these cases, and frequent child bearing or lengthened lactation seem also to be potent predisposing causes. In three of my cases the disease started almost immediately after a confinement and one suffered for a long time from a prolapsed uterus. In the foregoing statistics it will be noticed that there is a quick fall in the number of cases occurring after the climacteric has been reached. It would seem that the frequency of uterine disorders would lend support to the auto-toxaemic or the infectious theory as the uterus is so often the seat of chronic inflammatory changes and provides excellent opportunities for the absorption of toxic products or the entry of organisms into the blood stream. It is pointed out by many

observers that when men are affected it is generally the large joints such as the hip or shoulder that are involved. In all my male cases, I have none that have had the hip, all had one or both knees affected first.

4. Previous Illnesses.

It may be said that any and all of the conditions which lower the vitality predispose to the disease, some more than others. Brief reference is here made to the more frequent predisposing causes.

a. Catarrh of the mucous membranes. How far this may act as a predisposing cause is difficult to ascertain, but it certainly provides a means of entrance of organisms such as chronic catarrhal tonsillitis, and in others catarrh of the genito-urinary organs.

b. Pyorrhoea is frequently met with. In the case of my patients every one has had bad teeth. Some have had complete extractions many years ago, although stumps may occasionally be left behind, others still have very septic mouths. This must certainly produce much septic absorption and also provide for the entrance of organisms. Bad teeth are retained from a reluctance to any interference

or during industrial depression due to the want of means to pay. Pyorrhoea is so common that one wonders why there are not more cases of Rheumatoid Arthritis. Pyorrhoea probably acts by lowering the vitality and causing an auto-toxaemia or by affording an entrance to a specific organism but not as a direct cause of Rheumatoid Arthritis.

c. Uterine disturbances have been already mentioned.

d. Anaemia is frequently present, the patients having a sallow greyish appearance. All the cases with the exception of two have anaemia more or less.

e. Constipation seems only to be present in the female cases. Sluggish action of the bowels would, of course, help in the absorption of toxic products and generally helps to lower the vitality.

f. Only one of the cases has a history of rheumatism. One has a history of Pleurisy immediately before the attack, one of scarlet fever, and one of diphtheria.

g. Emotional causes. Grief, worry and anxiety are all said to play a part, not only as

predisposing causes but as factors influencing the course of the disease. Perhaps worry only acts by lowering the tone of the patient. Most if not all the cases I have presented have had enough worry financially and otherwise, during the past years of depression in the coal trade.

h. Traumatism. Only one case has a definite history of two serious accidents to his back while working as a miner underground just before his illness commenced. He perhaps is the most crippled of them all.

i. Climate. Exposure to cold and damp was regarded by Charcot as a most potent cause. He held that prolonged exposure was necessary and that the condition did not set in at once, but followed later. The disease is said to be commoner in Ireland than in England, frequent in Holland and rare in Canada.

## PATHOLOGY

### General appearance of the Joint.

In acute stages the joint is generally swollen in a characteristic ovoid manner; in the chronic stages the swelling may be somewhat irregular and generally is. Fluid is usually present, at least in the acute stages. The synovial membrane is thickened, in acute cases it is soft and pulpy; in chronic cases it may be hard and dense. The ligaments may also be affected. All the soft tissues undergo development. Later these form adhesions and contract and give rise to stiffness and limitation of movement and eventually lead to fibrous ankylosis of the joint. In acute cases, the cartilage is soft and frequently eroded in places. In some cases the erosion may reach the bone. In the chronic cases the cartilage is sometimes said to have a velvety appearance. In acute cases the bone is red and vascular, but later on it becomes hard and dense. In chronic cases there may be lipping of the cartilage and bone. Vide photographs of cases presented. The changes in the different parts in detail are as follows:-

### 1. Changes in the Synovial Membrane.

As already mentioned, the synovial membrane is

soft and pulpy, its blood vessels are prominent and it has a distinctly reddish appearance, while in places it has eroded into the underlying cartilage, probably by pressure. Later the villi become hypertrophied and sometimes undergo fatty or calcareous degeneration. They frequently resemble polypi, are very vascular and have a soft velvety feeling.

Sometimes loose bodies are found in the joint. These may be melon seed like bodies. It is believed that these are formed by fibrinous exudation. Other loose bodies are derived from the synovial membrane. As already mentioned, the ends of the fringes are occasionally the seat of calcareous degeneration. This may go eventually into ossification. These growths are at first pediculated, but eventually become detached and thus give rise to the loose bodies.

In the joint there may or may not be fluid present. In Rheumatoid Arthritis the joint does not suppurate. The fluid may contain more cells than normal synovial fluid and as already mentioned, organisms have been found by observers.

2. Changes in Cartilage.

The change found in the cartilage may be due either to pressure from the enlarged synovial fringes or as Bannatyne[4] believes, they may be involved at the early

stage in the disease. There is first a loss of their natural lustre, they become soft and have been likened to velvet in texture. The cells break down and erosions occur. Vide X-Ray films, Cases 2, 5, 6 and 15. As these continue the head of the bone may become exposed. Lipping of the cartilage occurs. This may be due to the erosion of the central portion while the marginal part remains unaffected, (pseudo lipping) or in chronic cases there is sometimes an actual proliferation of cartilage cells. This proliferation is generally irregular and forms nodules.

3. Change in the bone.

In the early stages foci of inflammation may be found in the bone near the joint. The bone is red and vascular; it is soft and may break. The cancellous tissue is more open and there is an absence of fat cells. As part of the bone is absorbed, it is replaced by a red semi-fluid material differing from normal marrow and consisting mostly of giant cells with many nuclei (osteoclasts) in a mass of round cells. Vide X-Ray films, Case 2. As the disease progresses, the bone exposed by the eroding cartilage becomes hard, white and polished and presents an ivory appearance which has been termed "eburnation". True bony ankylosis seldom occurs. Vide X-Ray film, Case 2. Volkman thinks that the changes are caused

by rarefying osteitis followed by an osteo-sclerosis. It is perhaps Nature's way of preventing the further spread of the disease.

4. Changes in the Muscles.

There is well marked atrophy of muscle substance. Each fibre is decreased in size, and the whole muscle is affected.

5. Changes in the Nervous System.

Folli[16] has described atrophy of the motor cells in the anterior cornua in a few isolated cases, but no constant change has been noted. Bannatyne[4] records one case which showed degeneration and vacuolation of the ganglion cells of the anterior cornua. In a few cases peripheral Neuritis has been noted. It is probably caused by an extension of inflammation from the joint.

6. Changes in the Heart.

These are few and would appear to have little connection with the disease in question.

7. Changes in the Kidneys.

Charcot and some of the French observers have recorded the occurrence of chronic albuminous nephritis. This is a rare complication in this country.

8. Changes in the Blood.

Anaemia is frequently present. The red blood corpuscles are diminished in numbers. The haemoglobin is diminished and there is a slight increase in the leucocytes.

9. Fibrous Nodules sometimes occur.

Small enlargements or osteophytic outgrowths from the normal nodule round the articular surface of the bones of the hand sometimes occur, but they are met with in other conditions. Their true nature and cause have given rise to much discussion. They were first described by Heberden[28] and are now known as "Heberden's Nodes". They generally arise from the second or third phalanges, are almost painless and do not ulcerate. They are not present in the acute forms of Rheumatoid Arthritis, but may be found in the chronic stages.

10. Cutaneous Changes.

Pigmentation and freckling of the skin (Vide Photograph, Case 7) are frequently met with. Sometimes the skin has a glazed appearance and there is a loss of hair. In many cases the toe nails become brittle and may drop off.

## BACTERIOLOGY

Many different microbes have been isolated from diseased joints. Schuller[44] in 1892, described a dumb bell shaped bacillus in association with chronic polyarthritis. Some years later Bannatyne and Blaxall[5] found a small bipolar bacillus which they isolated from synovial fluid. Fairweather[15] describes three different bacilli in connection with joints, though he made no claim that any was specific. Hale White[26] isolated a small bacillus from the mesenteric glands, also a coccus from the synovial membrane of the knee. Recently Costa and Bayer[10] have described a delicate gram negative coccus which they call the micrococcus arthriticus. This has been isolated on several occasions from acutely inflamed joints. More recently Ely ascribes osteoarthritis to protozoa which enter the system round the tooth sockets.

Finally, to complete the series of suggested specific microbes we must mention the micrococcus rheumaticus of Poyton and Payne.[41] Various streptococci are most frequently considered to be the cause of infection. In 1914, Hastings[27] found that out of a series of cases, 17 gave a positive and 18 a negative complement fixation test of streptococcus viridans, and therefore considered that 40% of the cases of Rheumatoid Arthritis are

infective. Among Mutch's[36] 200 cases of intestinal infection in chronic Arthritis, the vast majority were streptococci; from 21 cases in the course of laparotomies it appeared that the small intestine was the site of streptococcic invasion. Beddard[7] spoke of the long chained organism, streptococcus longus as present in 75% of the cases. Staphylococci appear to be much less often responsible than streptococci, although this is not now the opinion of many modern observers. In 1903 Dor[13] obtained staphylococcus pyogenes albus from the joint of a rheumatoid patient. Crowe[11] described as a causal agent, the staphylococcus epidermis albus, (deformans variety) which he called micrococcus deformans and which he maintains, after a long series of experiments, is the principle cause of Rheumatoid Arthritis. He obtained agglutinations of their own scurf cocci by blood in patients with severe Rheumatoid Arthritis. Among Mutch's[36] 200 cases, 4% only were associated with staphylococcus.

A natural objection to the infective nature of chronic Arthritis is the difficulty of obtaining micro-organisms from the joints, and even when they are obtained from chronic cases it might well be argued that the infection has supervened in a joint, rendered a place of diminished resistance by the arthritic change and that

the experimental production of joint changes in animals by the injection of such an organism, does not prove that the original arthritic changes in the patient were due to the organism. That the fluid removed from rheumatoid joints is almost always sterile, is not surprising from analogy with the same event in tuberculous pleurisy, but the rarity with which cultivation of pieces of synovial membrane, removed from such joints, gives a positive result in spite of numerous media employed, is a problem deserving further investigation and consideration, if the view that Rheumatoid Arthritis is due to chronic infection rather than to a toxic or metabolic factor is to be maintained.

# CASE RECORDS

## CASE 1.

T.L. Aged 61. No occupation. Widower.

Complaint. Stiffness and deformity in most joints. The patient is completely bedridden and unable to walk but is able to feed himself.

Family History. He states that one of his grandfathers suffered much from chronic rheumatism. His father died of pneumonia at the age of 39, and his mother lived to the age of 88. His brothers and sisters are all alive and are quite healthy.

History of Past Illnesses. The only illness before his present illness that he has ever had was Indigestion about twenty-nine years ago. He was then ill for about six months.

History of Present Illness. About eighteen years ago he had a severe accident while working underground as a miner. The roof of his working place fell in on him and the top coal fell mainly on the middle of his back. He was buried up to his neck under about a ton of coal and rubbish. Fortunately for him, his arms were raised and he was able to hang on to a timber post and

keep himself from falling. This saved his life. He was idle for over three months and then restarted work underground. Within a year from the time of the first accident he had a second accident, when he fell against a "gob" injuring his back again in the same place. After this he did not resume work underground again and only did odd jobs on the surface. Apparently the employers disputed their liability of the accidents and he failed to maintain his claim at the County Court through some legal quibble. This worried him not a little. About six years after the second accident he was working under a contractor who was laying down large sewage pipes alongside a river. One day while walking in the river in large thigh wading boots, he tripped and fell into the water and got a bad wetting from which he caught a severe chill. A few weeks afterwards he felt his hip joints and legs becoming stiff and in a short time he was unable to walk. This condition subsided and he was again able to walk but shortly afterwards he found that the joints of his fingers were swelling and becoming painful. The left knee joint was the next to be affected, then the right elbow, then his feet, all becoming very swollen and painful. His hip and shoulder joints became stiff but little or no change tookplace in them. He also felt stiffness and pain down the back

of the neck and in the tempero-maxillary joints particularly the right. His teeth were fairly good but were all extracted years ago.

Present Condition. He has been bedridden for years. He is not anaemic. He looks well nourished but the muscles are atrophied and covered with a good layer of fat. The skin is dry and scaly. There is a glossy appearance on nearly all the joints, particularly the knee joints and the joints of the fingers. His heart and vessels are healthy. He has never been troubled with constipation. The palms of his hands are moist and clammy.

Condition of Joints. The conditions of the joints of the wrists, elbows, knees and ankles are well brought out in the photograph marked Case 1. The phalangeal joints are not enlarged or swollen but are very deformed. The distal joints are flexed and the proximal over extended. The thumbs are extended and cannot be flexed and lie on the palms of the hands. The phalangeal joints are ankylosed. Both wrist joints are enlarged and have very limited movements. The left elbow joint is practically normal, except for some stiffness. The right elbow joint is enlarged, the upper end of the ulna being much enlarged and mis-shapen. The

movements in this joint are very limited and jerky. Gratings and creakings are distinctly heard and felt. The shoulder joints are fairly free and nearly normal except for creakings. Both the hip joints are also nearly normal except for some stiffness and creakings. The left knee joint is enlarged and is usually kept in a completely extended position but after a little gentle rubbing and coaxing it can be suddenly flexed with a loud click and a noise like that heard on breaking down a number of fresh adhesions. The right knee joint is not so enlarged and the movements are fairly free. Gratings are, however, heard and felt. Both ankle joints are enlarged with limited movements. Toes are deviated to the fibular side. The nails are brittle and crack.

Comments. This is a typical case of advanced Rheumatoid Arthritis. This patient did not come under my care until he was completely crippled and bedridden. He is very cheerful and astonishingly happy in spite of his terrible condition. The treatment is simply massage daily, plentiful good nourishing food, cod liver and malt and allowed out in the fresh air and sunshine when possible.

Is the trauma the cause in this case or was it the chill after the wetting in the river, or was it the worry over his compensation for his accidents or was

there s ome infective focus somewhere in the mouth or in the intestinal tract, lying latent for something to make it flare up? Perhaps and more than probable all had something to do with the cause.


CASE 1.

CASE 2.

A.M.A. Aged 49. No occupation. Widow.

Complaint. Complete crippling of some joints and pain and stiffness in others, most of the joints being affected more or less.

Family History. Both her parents are alive and healthy. Her father is 72 and her mother 82. One sister suffers from rheumatism but all the others are healthy. Her husband died of pulmonary tuberculosis.

History of Past Illnesses. She has never had any serious illness until the present one commenced.

History of Present Illness. During 1911 shortly after the birth of her third child the left little finger and both knee joints began to give her a lot of trouble and pain and gradually swelled up. Then by slow degrees every joint became swollen and painful. This condition remained for about five or six years until she became crippled and practically bedridden. She thinks the cause of the disease in her case was due to shock, for when she went into the bedroom of her father-in-law one morning she found him dead on the floor with his throat cut, and she was then three months pregnant. Her teeth were always very bad and were only after much persuasion extracted five months ago. Her tonsils and nose

never gave her any trouble.

Present Condition. She is well nourished and has a cheery and happy disposition. There is no anaemia, and has good colour. The skin is dry and covered with powdery scales. There is a glossy appearance on nearly all the joints. There is a brownish pigmentation all over most of the body. She does not suffer from constipation.

Condition of the Joints. This is well shown in the photograph, Case 2. The fingers are completely ankylosed and flexed rigidly into the palms in the right hand and nearly so in the left. The phalangeal joints are nodular. Both wrist joints are enlarged and rigidly ankylosed and partly flexed. The right elbow joint is enlarged and completely ankylosed almost at a right angle. There are three or four hard nodules just about two inches below the joint - one is seen well in the photograph. The left elbow joint is fairly moveable and has three hard nodules around it. There are sufficiently good movements in the left elbow to enable her to feed herself. The shoulder joints have very limited movements without any enlargement but loud gratings are heard and felt. Her back is somewhat stiff. Her neck has free movement from side to side but she has

difficulty in keeping the head up. Her hip joints have fairly free movements and she is able to walk with a little assistance. The knee joints are much enlarged as seen in the photograph and are kept in a slightly flexed position usually. The ankle joints are stiff and thickened and almost ankylosed. The toes show fibular deviation. For a time the second toe in the left foot showed gangrenous symptoms but these have cleared up leaving a scar.

X-Ray films were taken by a Cardiff Radiologist, Dr. Garfield Evans, who reported as follows:

X-Ray Examination of the Right Wrist and Hand.

Right Hand. The X-Ray examination of the right hand shows erosion of the articular cartilages of the wrist and carpal joints. The wrist joint is completely disorganised and there appears bony union between the radius and the carpus.

Finger Joints. Note the marked deformity of the fingers. The interphalangeal joints are disorganised and there is practically complete erosion of the articular cartilages, also marked general rarefaction of bone can be seen.

Carpal Joints. All the carpal joints are also disorganised.

Right Elbow. There is complete erosion of the articular surfaces of the lower end of the humerus, ulna and radius. No joint spaces can be made out. The right elbow is therefore completely disorganised. No special new bone formation can be seen.

Left Knee. The joint space is markedly diminished owing to erosion of the articular cartilage. There is also marked rarefaction of the shaft of the femur and tibia. The compact bone formation can be seen in the region of the knee joint.

Comments. This patient did not come under my care until she was crippled. Apart from the general home treatment, she was admitted to Llandrindod Wells Hospital about three years ago. She was quite unable to walk when she was admitted. She states that she was treated at the Hospital with electric treatment and sun ray and benefited so much that she has ever since been able to walk almost without support or assistance.

The cause in this case is probably due to bad teeth which she resolutely refused to have extracted until five months ago, no reaction following. Added to this, is the possible uterine infection as the disease started almost immediately after a confinement. The shock of seeing her dead father-in-law under such

tragic circumstances when she was pregnant may have added to the other causes.

Attached is a photograph of the street in which this woman has lived all her lifetime - a colliery siding behind and a dirty, adulterated river in front.

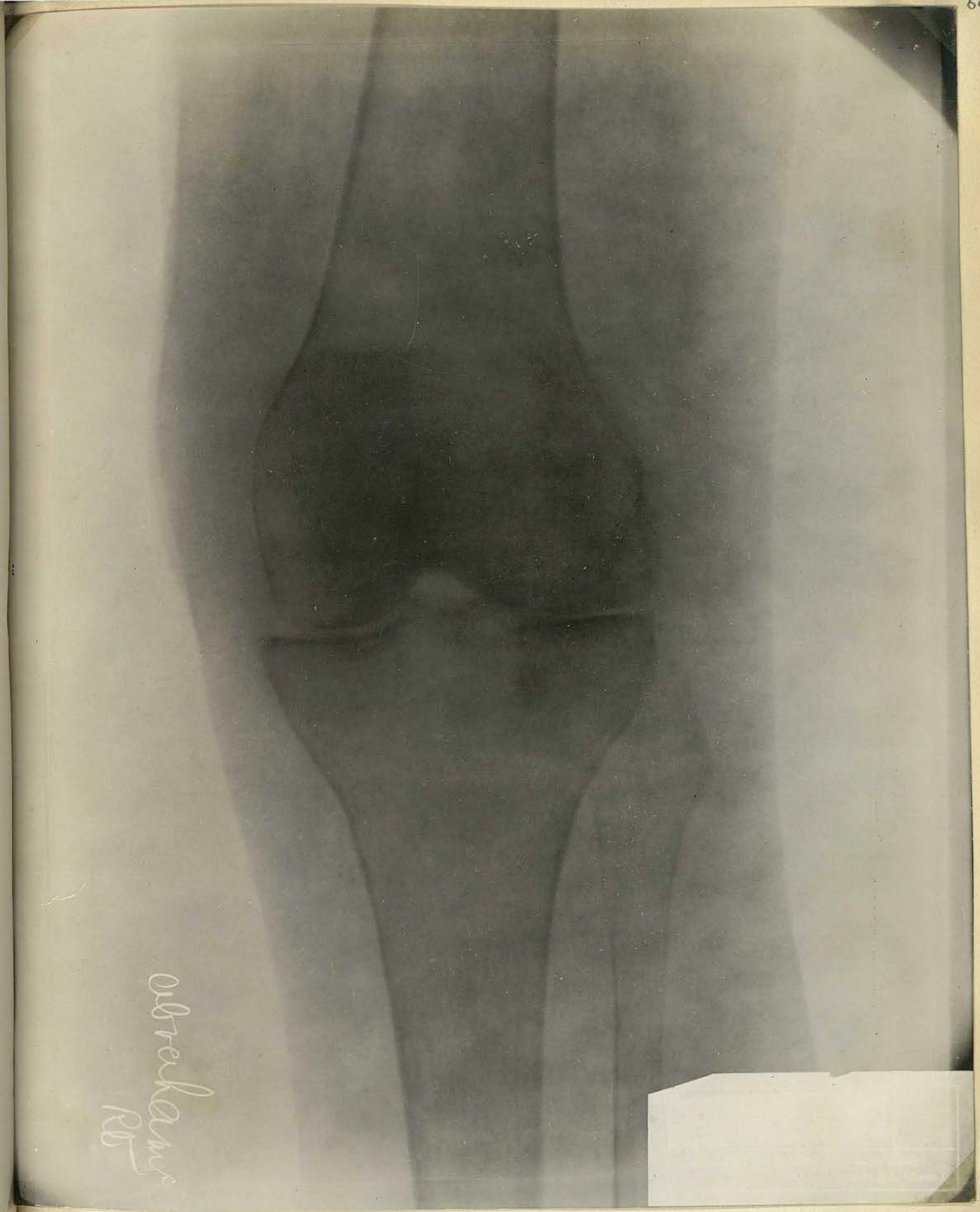

CASE 2.


CASE 2.

Back of very old-fashioned Company houses with Colliery railway siding behind and a river in front into which everything is thrown.

CASE 2. (Right hand)

CASE 2. (Right elbow.)




CASE 2. (Right knee.)

CASE 3.

M.T.B. Aged 70. No occupation. Married.

Complaint. Crippling of joints with occasional pains and consequent difficulty in walking.

Family History. The patient has never heard of any of her relations having suffered from rheumatism.

History of Past Illnesses. She has never had any illness previous to the present illness.

History of Present Illness. Shortly after the birth of a son thirty-one years ago all the joints more or less became swollen, painful and stiff. She was then confined to bed for eleven months. She says that the teeth were always very bad with pyorrhoea and all were extracted at different times during the first two years of her illness. She attributes her illness to a sudden chill she had after her confinement. She describes this confinement as a very difficult one and after the child was born states that a portion of the placenta was retained for two or three days causing a good deal of septic infection until it was completely removed.

Present Condition. The patient does not look her age and would be taken for a woman of sixty rather than

seventy. She is fairly well nourished and of a cheerful and happy disposition. There is no anaemia. The skin is slightly dry. Muscles are of fairly good tone and she is fairly active in spite of the condition of her joints. Her heart and vessels are normal. She suffers a good deal from constipation.

Condition of Joints. The hands are badly deformed as seen in photograph, Case 3. The phalangeal joints are thickened especially in the right hand. Here the terminal joints are over extended while the proximal are flexed. She can only close the fingers on the palm half way. The thumbs are extended and tend permanently to lie on the palms of the hands. The metacarpal phalangeal joints are stiff and thickened especially in the left hand. The wrist joints are enlarged and stiff especially the left wrist. The elbow joints are chronically enlarged and the movements are limited. She is, however, able to feed herself. The shoulder joints are stiff and gratings and creakings can be heard and felt. The movements of the shoulder joints are fairly wide. The hip joints are enlarged and very stiff especially the right one. This makes walking difficult but she gets along quite well taking short steps. The knee joints are swollen and stiff but moveable. There is much grating in the knees. The ankle joints are

enlarged and practically ankylosed. The toes are deviated to the fibular side. The nails are brittle and occasionally fall off. She has had no Hospital treatment. After being in bed for eleven months she gradually improved into her present condition.

Comments. The chill she describes as the cause may probably have been a severe rigor from the infection first started in the uterus after her confinement. It was long after she was crippled that I attended her although she declares that I was called in by the doctor who attended her at her confinement and that I removed the pieces of the placenta left behind. I have no recollection of this. I advised it appears at the time admission to Hospital but this was not done. Possibly if she had been admitted at once and had been curetted or something else done to make her aseptic, the disease might have been there and then prevented.


CASE 3.

CASE 4.

A.E.D. Aged 39. No occupation. Married.

Complaint. Stiffness in most joints and crippling of arms and legs.

Family History. He is unable to recollect that anyone of his family ever suffered from rheumatism.

History of Past Illnesses. He had a bad attack of right sided pleurisy in 1922. All his teeth were very bad for years and he had them extracted in 1923.

History of Present Illness. Almost immediately after recovering from the attack of pleurisy his left knee joint became swollen, painful and stiff. This was followed by practically every joint becoming gradually swollen, painful and stiff. The shoulder and hip joints were painful and stiff but did not become swollen. The ankle and toe joints became swollen and painful. He was confined to bed completely for about eighteen months.

Present Condition. He is a thin wiry built man. He is anaemic and has a greyish sallow appearance. The skin is not dry but the palms of his hands and the soles of his feet are clammy and moist. The muscles are atrophied. The heart and vessels are normal. He is always more or less constipated.

Condition of the Joints. In the right hand the phalangeal joints are enlarged. The fourth and fifth fingers are flexed at the proximal ends and ankylosed as seen in the photograph, Case 4. He is quite unable to close the fist. There is ulnar deviation. In the left the movements are free in the phalangeal joints and there is no swelling. The right wrist joint is completely ankylosed. The left wrist joint is ankylosed in a slightly flexed position. There is a complete ankylosis of the right elbow at a right angle. There is slight movement. The left elbow joint is in a similar condition. He is able to feed himself. The hip joints are free. The left knee joint is enlarged and has very limited movements which produce loud creakings. The right knee joint is chronically enlarged but movements are fairly free. The ankle joints are enlarged and stiff and the movements are limited. The toes are stiff and are deviated to the fibular side. The nails are brittle and sometimes crack. He has had Hospital treatment at Bath where he was treated with hot brine baths and electric baths which produced an improvement.

Comments. He has only lately come into the district as a parish patient and I have only seen him for a few months. He attributes the cause to the attack of

pleurisy but as his teeth were always in a deplorable condition they may have been the source of latent infection which was made to flare up by the pleurisy.


CASE 4.

CASE 5.

A.M.V. Aged 34. No occupation. Married.

Complaint. Swelling and deformity of the hands and knees with stiffness of nearly all the joints.

Family History. She states that a sister of her mother suffered from Rheumatoid Arthritis. She has no knowledge of any other relation having suffered from rheumatism.

History of Past Illnesses. She has never had any other illness.

History of Present Illness. About twelve years ago just after the birth of her first child, she noticed that all the joints became stiff, beginning with the finger joints. This passed off but she always noticed that after the births of the other children the stiffness of all the joints returned. Two years after the second child she could not bend her body properly, because of stiffness and pain in the left groin, describing it as if she felt "the sinews in the groin were tight".

Present Condition. She is a thin spare built woman. She is not anaemic but her muscles are atrophied. Her skin is dry and scaly. Her heart and vessels are normal. She does not suffer from constipation.

Condition of Joints. See photograph, Case 5. There is fusiform swelling of the phalangeal joints. The little finger of the right hand is thickened and swollen. She is unable to close the fist completely. There is slight over extension of the terminal phalanges and flexion of the proximal joints. The movements of the fingers are fairly good. The right wrist joint is swollen and painful. The right elbow joint is swollen and it cannot be fully extended. Both the shoulder joints are stiff and painful. She has pain down the back of her neck and lateral movements are difficult and she is unable to hold her head up properly for any length of time. The hip joints are painful but are not stiff. The knee joints are both swollen and painful. The flexion and extension of the knee joints is very good. There is slight swelling and some stiffness in the ankle joints. The toes are stiff.

X-Ray Report by Dr. Garfield Evans, Radiologist, Cardiff.

Right Hand. No special changes can be seen in the phalangeal or metacarpo-phalangeal joints. The soft tissues of the little finger can be seen to be swollen and the joints of this finger are flexed.

Right Wrist. The joint space between the radius and the carpus is diminished due to erosion of the

articular cartilages. Apart from this and some general rarefaction of the bones no special radiological changes can be made out.

Left Knee Joint. No special radiological changes can be seen in the bone round the joint. The articular surfaces appear to be normal. There is no new bone formation of any account.

Comments. This patient all through her illnesses has kept on doing somehow or other her domestic duties and produced children. Seven years ago her condition was becoming serious and I had her admitted to Llandrindod Wells Hospital. The treatment she received there appears to have consisted of injections probably vaccines with electric treatment. She was admitted for a second short period two years ago. She refuses to have the remaining teeth extracted for some unknown reason. The treatment in the Hospital improved her considerably but she is more likely to become worse as she continues to have children and continues to live in a damp, miserable little house doing all the household work and attending to her four children as well as her husband who is very often out of employment. Bad times have also made it difficult for her to get suitable nourishing food. A further period for a fair length of time this summer and the extraction of the remaining teeth may save her from becoming a complete cripple.


CASE 5.

CASE 5. (Left knee.)

CASE 5. (Right hand.)

CASE 6.

W.H.J. Aged 51. Occupation, surface engine driver. Single (His work is on a tip high up on the mountain side which is very exposed to all weathers.)

Complaint. Swelling and pain in wrists, fingers, knees, and ankles and inability to walk.

Family History. An aunt on his father's side suffered from Rheumatoid Arthritis. His brother and sister are quite healthy. His parents died of old age and were always healthy.

History of Past Illnesses. The patient says he had "inflammation of the bowels" when he was 9 years of age. He has not got a very clear impression of the illness except that he was perfectly well afterwards. He has had two attacks of acute tonsillitis, the last occasion about ten years ago. He has had several attacks of influenza, all of short duration. His teeth were very bad and he had the top lot extracted twenty years ago. The lower teeth were extracted ten years ago, after the second attack of tonsillitis. He attributed his bad teeth as the probable cause of this trouble.

History of Present Illness. In January of 1931 his knee and ankle joints gradually became stiff but

there was no special swelling and he had difficulty in walking. This was followed by a gradual swelling of the knee joints which became painful. He was then confined to bed for six weeks. No particular focus of infection could be found and he attributed his illness to cold and exposure during his work. Nothing could induce him then to be admitted to Hospital for fear of losing his work or submit to vaccine treatment. He resumed his work and maintains that he was until January, 1933 fairly fit, with nothing much the matter with him except occasionally pains in the joints. In January, 1933 he had what he calls a severe cold. His wrist, elbow, and shoulder joints became painful and stiff. Later the wrist joints began to swell. He describes what he calls a "gnawing" pain in all his joints. This time he was confined to bed for three months and was at last persuaded to be admitted to Hospital since he would not undergo any special treatment at home. He was admitted to Llandrindod Wells Hospital but could only be retained for three weeks on account of the demand for beds for other patients. He states that in the Hospital he received radiant heat treatment one day followed by needle spray the following day. He did not appear to have had any special treatment such as vaccines. He returned home improved and continued to improve. Although not really fit he resumed his work in August having been idle six months. In March, 1934 having worked fairly regularly for nine months, the wrist, knee and ankle

joints again became swollen, stiff and painful. He was this time confined to bed for three months and still very stubborn about having any special treatment. However, he was again admitted to Llandrindod Wells Hospital. He was treated with radiant heat and sprays alternate days and with injections every other day. He is unable to say what the injections were. As they were administered every other day they could hardly be vaccines. He returned feeling better except that his left knee joint remained swollen. He has worked regularly until the present illness.

Present Condition. He is a spare built man 5 feet 4 inches in height. He is slightly anaemic and has a greyish sallow complexion. His skin is dry and scaly. The muscles are atrophied covered with a fair layer of fat which makes him look fairly well nourished. His heart and vessels are healthy. He does not suffer from constipation and has never had any digestive trouble in spite of his early bowel illness. He is very hairy over the chest, arms, and legs, but there is no pigmentation of the skin.

Condition of Joints. The phalangeal joints show fusiform swelling with a distinct glossy appearance. See photograph, Case 6. The fingers are slightly flexed but

but the joints move freely and painlessly. The wrist joints are swollen stiff and painful. There is slight swelling in the right elbow but none in the left. Both are stiff and painful at times. The shoulder joints appear normal but are stiff and painful occasionally. The movements of the neck are normal. The hip joints give no trouble and appear normal. Both knee joints are swollen, stiff, and painful, especially the left knee which has become chronically enlarged. The knees are kept always in a slightly flexed position. The ankle and toe joints are swollen and painful. The nails are brittle and break. One has fallen off. Fortunately he has a comfortable home and is well cared for by his brother and his sister-in-law. He is again down for admission to Llandrindod Hospital and if possible for a longer period this time.

X-Ray Report by Dr. Garfield Evans, Radiologist, Cardiff.

Hands. No special radiological changes can be seen in the phalangeal joints or the carpal-phalangeal joints.

Wrist Joints. There is considerable erosion of the articular cartilages of his wrist joints and especially of the carpal joints. There is no evidence of any new bone formation or any special rarefaction of the bones.

Left Knee Joint. No special radiological changes can be made out in this joint. Probably there is some

slight erosion of the articular cartilages. There is no evidence of any osteo-phytic outgrowths and no special rarefaction of the bones.

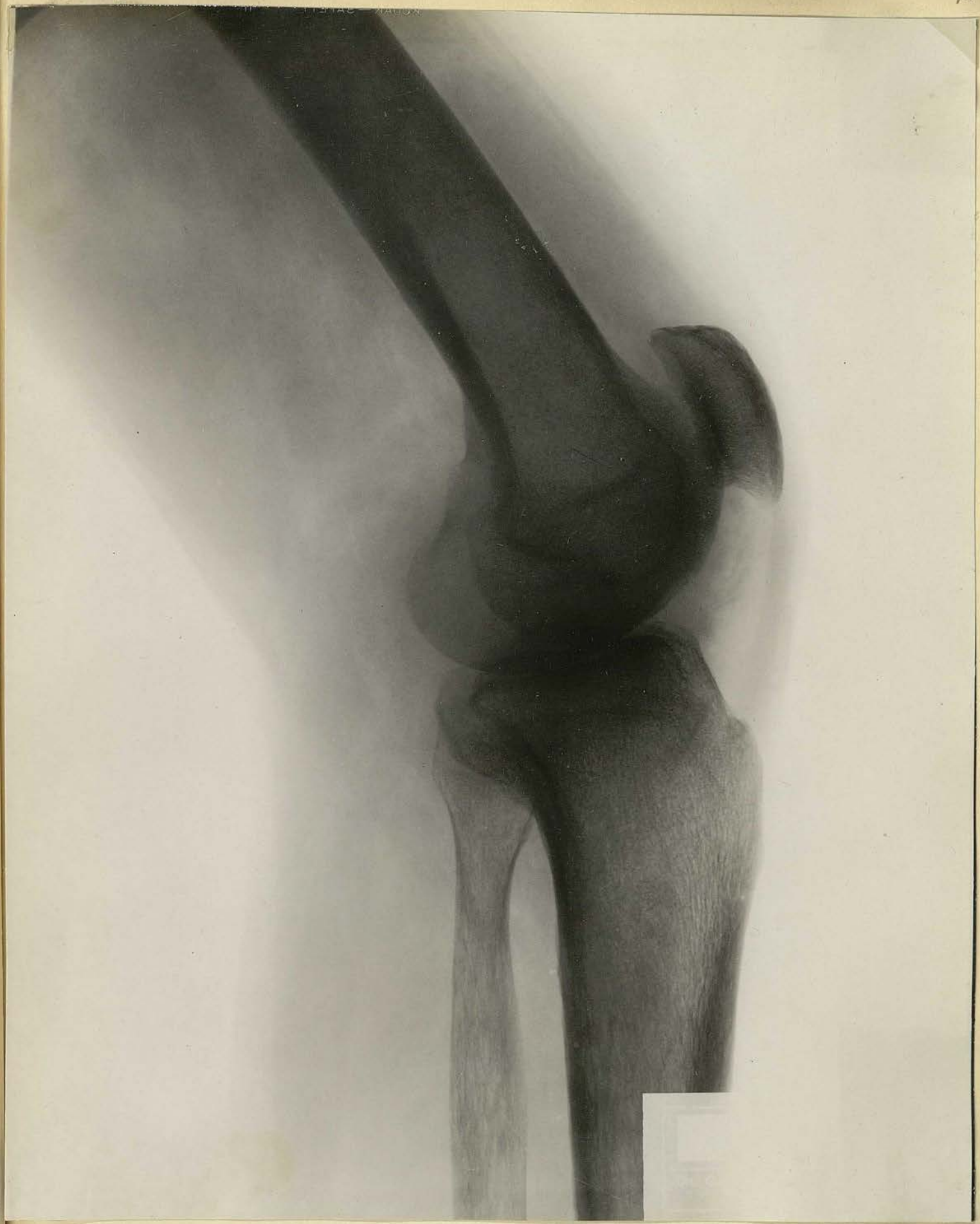
Comments. This is a case, if the patient would submit to some special treatment under constant medical supervision, such as vaccines, which would in all probability be completely cured.


CASE 6.

CASE 6. (Hands and wrists.)

CASE 6. (Left knee.)

CASE 6. (Left knee.)



CASE 6. (Left Knee.)

CASE 7.

M.M.E. Aged 26. No occupation. Single.

Complaint. Swelling of wrist joints with pain and stiffness of all the other joints very occasionally.

Family History. She does not know of any relation near or distant who suffers or has suffered from rheumatism.

History of Past Illnesses. Apart from having measles and mumps when a child she has always been very healthy. Her teeth have been indifferent and she has suffered a lot from toothache. All the bad teeth have been extracted recently.

History of Present Illness. About three and a half years ago she found that both of her knee joints were becoming stiff and later gradually swollen. She describes the pains in the joints like that of toothache. Later the finger and the wrist joints became swollen and apinful. Some time afterwards all the other joints became painful, swollen, and stiff, including the tempero-maxillary joints which made it difficult for her to open her mouth. The cervical joints also became stiff and painful and she could not move her head, nor could she hold her head up normally. She was then confined to bed

for twelve months. She would not submit to vaccine treatment and ultimately became very thin and anaemic. As she was a parish patient she was admitted to the Merthyr Tydfil Infirmary where she remained for six months. She discharged herself far from fit and in about three months had a bad attack of pleurisy. She was again admitted to the Merthyr Tydfil Infirmary, and remained there for four months. She was discharged not greatly improved and was in and out of bed during the next twelve months. She was then admitted to Bath Hospital, where she says she had electric treatment and hot brine baths. She returned feeling better but felt her joints stiff and found difficulty in walking. She declares that three months after her discharge from Bath Hospital she felt a continuous gradual improvement, the joints as she says becoming "slack" and moveable and has only occasional pains. This improvement has been maintained up to the present time.

Present Condition. She is of slight build about 5 feet in height. She is now well nourished and has a healthy fresh complexion. What teeth she has now are good. The tonsils are healthy. The heart and vessels are normal and she is not troubled with constipation.

Condition of Joints. See photograph, Case 7. The

phalangeal joints are slightly fusiform in shape and slightly flexed in position but movements are good. There is some thickening in the wrist joints especially in the right with limited movements, but no pain. Gratings are heard and felt. The elbow and shoulder joints appear normal and the movements are fairly full. Movements of the neck are now practically normal. There is some chronic swelling in the right knee, and grating and creakings are heard and felt in the left knee which is slightly enlarged. The movements are fairly free and painless. There is a brownish mottling all over the front of the legs, well shown in the photograph, and over the back. The ankle joints are thickened and stiff, with loud creakings. The toes appear to be normal except the great toe joints, which are enlarged. The nails are brittle and sometimes crack.

Comments. This is a case where the cause probably was due to under nourishment together with some focal mischief caused by bad teeth. She made a really remarkable recovery and is an example of what hospital treatment under proper supervision can do for these cases. Her youth probably was a great help in her recovery.


CASE 7.

CASE 8.

H.L. Aged 47. No occupation. Married.

Complaint. Crippling of both legs with occasional pains in the hips and difficulty in walking.

Family History. All her near relations were free from rheumatism and apparently normally healthy except an aunt on her mother's side who has Rheumatoid Arthritis, and is Case 9.

History of Past Illnesses. She has never had any illness worth mentioning and has always been fit and well until this illness commenced.

History of Present Illness. During 1926 she first felt tingling feelings in her fingers, arms and feet[18]. Shortly afterwards the right knee joint gradually began to swell and become painful as well as slowly stiffening. Then the left knee joint gradually became like the right one. After a few months practically all the joints became slowly swollen, stiff and more or less painful. She was now unable to move about very much and ultimately had to remain altogether in bed, to which she kept for over four months. The swelling in the joints gradually subsided with the exception of the hip, knee, and ankle joints, the right side being worse

than the left. She was then admitted to Llandrindod Wells Hospital in 1927 where she remained for six weeks. She states that she was treated with injections once a week and needle baths. She does not know what the injections were. The treatment improved her so much that she was able to walk with a little assistance and has done so ever since. During 1934 she had a further three weeks of hospital treatment and hopes to go again this year. All her teeth had been very bad and she had them all extracted in 1916. A stump which was left behind was extracted in 1920 so that all her teeth were extracted six years before the commencement of her illness.

Present Condition. She is anaemic and has a greyish sallow complexion with flushed cheeks. She is well nourished although the muscles show atrophy. This is improving from daily gentle massage. There is no pigmentation of the skin but there is a glossy appearance of the phalangeal and knee joints. The heart and vessels are normal and she does not suffer from constipation.

Condition of Joints. The phalangeal joints show some fusiform swelling and the terminal joints are a little over extended. The metacarpal-phalangeal joints in the left hand are enlarged and thickened. The movements are practically normal. There is no swelling or

stiffness in the wrist joints although there is a small hard node about the size of a large pea, on the radial side of the wrist. The elbow and shoulder joints appear to be normal, with possibly some stiffness which she does not appear to be aware of in comparison with the other joints. There is distinct stiffness in the cervical joints, and she has difficulty in moving her head and when she turns her head she has to turn her body with it. She also has difficulty in holding her head up, and states that every time she lifts her head she feels a grating sensation in the neck. The movements in the hip joints are very limited and there is very little flexion and extension of the thighs causing her to walk by little short steps. There does not appear to be any visible enlargement of the hip joints but there is a certain amount of ankylosis. Both the knee joints are enlarged and thickened but the movements are fairly free. The ankle joints are thickened and stiff with limited movements. The toe joints are stiff and deviated to the fibular side.

Comments. All the treatment she could obtain in her little miner's house before going to hospital was the usual treatment to tone up the system generally. Tonics, sedatives, cod liver oil, and passive movements,

and such nursing that a District Nurse can spare her. The focus of infection is obscure. Possibly the anaemia and the previous bad teeth had stored up some latent focus of infection which suddenly flared up without any apparent cause and started the illness. She has had nothing to worry her and she has always been of a cheerful disposition and lived contently the ordinary life of a miner's wife. The fairly early treatment at hospital probably cut short and improved, what at first glance looked like a very serious infection.

CASE 9.

E.A.R. Aged 66. No occupation. Widow.

Complaint. Pains in arms. Swelling of wrists. Occasional pains in the ankle and hip joints.

Family History. She says that she has no relations who ever had rheumatism except a niece (Case 8) who was taken ill long after her own illness.

History of Past Illnesses. She, for many years, suffered from attacks of asthma, which disappeared for good when the present illness commenced.

History of the Present Illness. During the summer of 1914 all the joints became gradually stiff and shortly afterwards both knees became swollen and painful. All the other joints were more or less swollen. She was completely confined to bed. After about six months the joints began to improve leaving only swelling of the phalangeal, wrist, knee and ankle joints. Her teeth were very bad and were all extracted in 1926 twelve years after the commencement of her illness.

Present Condition. She looks healthy and well nourished. She is not anaemic. The muscles of the legs are atrophied but those of the arms seem to be in good tone. The skin is dry. The heart and vessels are

normal. She says she suffers a lot from constipation and has always to take laxatives.

Condition of Joints. There is distinct fusiform swelling of the phalangeal joints. There is extreme flexion of the terminal phalangeal joints. The other joints of the hands are fairly moveable and she makes a good fist. The wrist joints are chronically enlarged with limited movements. There is some enlargement of the elbow joints but the movements are fairly free. The shoulder joints are free. The cervical joints are free. There is distinct chronic enlargement of both of the knee joints but the movements are fairly free. The hip joints do not appear to be affected but the ankles are thickened and stiff. The toes are stiff. The nails are brittle and easily crack.

Comments. This patient was taken ill shortly after I was called up on August 4th, 1914. She was unfortunate in having to be attended by many locums who came and went, and doubtless did not get the continued attention that she should have had. She was fortunate in recovering as well as she did. To-day she is quite cheerful, practically free from pain most of the year, and generally seems to maintain the improvement she has gained. When I saw her on my return four and a half years after she was much as she is to-day. I have presented her case as she is the aunt of Case 8 and an example of the few cases that recover much, even with the modicum of treatment.

CASE 10.

A.M.M. Aged 32. No occupation. Married.

Complaint. Pains, stiffness and swelling in knee joints and the joints of the hands.

Family History. No one in her family except a sister - Case 11 - has ever suffered from rheumatism.

History of Past Illnesses. When she was a child, she had scarlet fever and diphtheria which left no complications.

History of Present Illness. In February, 1926 she had a severe attack of influenza and before she had completely recovered, she went to a funeral on a very wet day. Shortly after this the joints of her fingers and both wrists became swollen and very painful. Later the ankle and toe joints became swollen and painful. The elbow joints then became swollen and she was unable to feed herself. She was bedridden for four years. She was then admitted to Llandrindod Hospital and was treated there for six weeks. She states the treatment she received there, was daily injections, sun ray exposures, medicine, and the local waters. On being discharged she was able to walk with assistance.

Present Condition. She looks remarkably well

considering her distressing condition. She is not anaemic and has a fresh slightly flushed complexion. The muscles are atrophied but she is plump with covering fat. The skin is very dry and in some places scaly. The heart and vessels are normal. All the upper teeth have been extracted but she has ten lower teeth with pyorrhoea. This condition has supervened since she was in hospital. There is no pigmentation of the skin and she does not suffer from constipation.

Condition of Joints. There is distinct fusiform swelling in the phalangeal joints of both hands. There is over extension of the distal joints in the right hand while the proximal are flexed. See photograph, Case 10. There are loud creakings on movement. The right wrist joint is enlarged and ankylosed. The elbow joints are enlarged with gratings, and limited movement. The shoulder joints are normal, and the neck is freely moveable. The hip joints are stiff, and movements are slow and deliberate. The knee joints are enlarged and held in a semi-flexed position. Movements produce loud gratings and creaking. The ankle joints are enlarged with limited movements which produce loud grating noises. She is able to walk slowly about the house but is unable to go any distance. The toe nails are brittle

and occasionally fall off.

Comments. I did not see this case until a few months ago. Her surroundings are bad; the photograph of the back and front of the street she lives in shows this, an exposed end house and a disused canal behind, the receptacle of all the rubbish that can be thrown into it. Her husband is unemployed and there is little hope of improvement with any treatment that can be given at home. She will be admitted shortly to hospital.


CASE 10.


Back of a long row of houses in which two families and sometimes three live at a time. A dried up canal is at the back in which every conceivable thing is thrown.


Front of same long row of houses.

CASE 11.

M.H. Aged 29. No occupation. Married.

Complaint. Stiffness down the backbone. Swelling and pains in the joints of the fingers, wrists and ankles.

Family History. She is a sister to Case 10.

History of Previous Illnesses. She has always been healthy until the present illness. She had internal haemorrhoids removed in 1932.

History of Present Illness. In 1929 almost immediately after the birth of her son, she began to feel stiffness and pain in nearly all her joints. Then followed pains in the back extending from the top of the neck to the middle of the lumbar area. Later the joints of her fingers began to swell followed by the wrist joints and then by the ankle and toe joints. The hip and knee joints have been painful and stiff but there has never been any swelling. She has stiffness in nearly all the joints. The teeth were very bad before she had them extracted a year ago.

Present Condition. She has no anaemia. The muscles are atrophied in the hands, elsewhere the tone

seems to be good. The skin is slightly dry. The heart and vessels are normal.

Condition of Joints. Distinct fusiform swelling of the phalangeal joints. The wrist joints are enlarged, stiff, and painful. The ankle and toe joints are somewhat enlarged and painful especially at night. There is no swelling, but pain and stiffness in the hip, knee, elbow and shoulder joints.

Comments. The confinement would appear to be the cause in this case. This patient carries on, just as if she were quite well. Economic circumstances will not permit her to remain in bed and have proper care and treatment, husband and children must be looked after and her health sacrificed.

CASE 12.

M.B.J. Aged 66. No occupation. Married.

Complaint. Swollen feet and knees, and difficulty in walking.

Family History. Her father suffered from asthma. Her mother lived to the age of 84. The rest of the family were all healthy.

History of Past Illnesses. She was always healthy except for the time when she had prolapsus uteri which she thinks was caused by lifting a heavy tub.

History of Present Illness. In 1925 she noticed that her knee joints were gradually swelling with a feeling of shooting and tingling sensations. Some months afterwards the ankle joints became swollen and painful. She improved for a time and then the condition became worse. The patient is of the opinion that the disease started after a shock when her daughter-in-law died suddenly in the back garden and on the same day she had news of the sudden death of her mother. She became bedridden and later was admitted to Llandrindod Wells Hospital. There she was treated with radiant heat, hot baths every evening with massage the following morning.

Before going to Hospital practically all the joints were affected. She is now able to move her arms and feed herself but cannot walk without assistance. Her teeth were very bad and have all been extracted a few at a time.

Present Condition. She is not anaemic. The muscles are atrophied, but they are well covered with fat. Skin is not dry, and there is no pigmentation. The heart and vessels are healthy. She suffers much from constipation.

Condition of Joints. The phalangeal joints do not show much change. The wrist joints are enlarged and stiff but the range of movements is fair. The elbow and shoulder joints and spine do not show any change and the movements are good. The hip joints show no changes but are stiff. The knee joints are much enlarged, and stiff, and kept in a semi-flexed position. The movements of the knees are very limited and loud creakings and gratings are heard and felt. The right knee is stiffer than the left. The ankle joints are very enlarged and are completely ankylosed. The nails are brittle and broken. When walking she walks nearly on her toes.

Comments. She is a very difficult case to

treat. She is very old fashioned in her ideas and modern treatment was anathema to her. All the old-fashioned remedies suggested by her friends and neighbours were of more importance and better than any physician could give her. It was with great difficulty she was persuaded to enter a hospital but as the results were good she is not quite so prejudiced. The infected focus was probably either from the septic uterus or from the bad teeth and the sudden intense grief and shock which she experienced in one day may have started the active symptoms of the disease.

CASE 13.

R.E.W. Aged 33. Unemployed. Married.

Complaint. Swelling and pain in the finger joints. Stiffness more or less in all joints with occasional pain.

Family History. His mother suffered from Rheumatoid Arthritis commencing almost immediately after his birth. The rest of his relatives were all healthy.

History of Past Illnesses. He has never had any illness before this commenced.

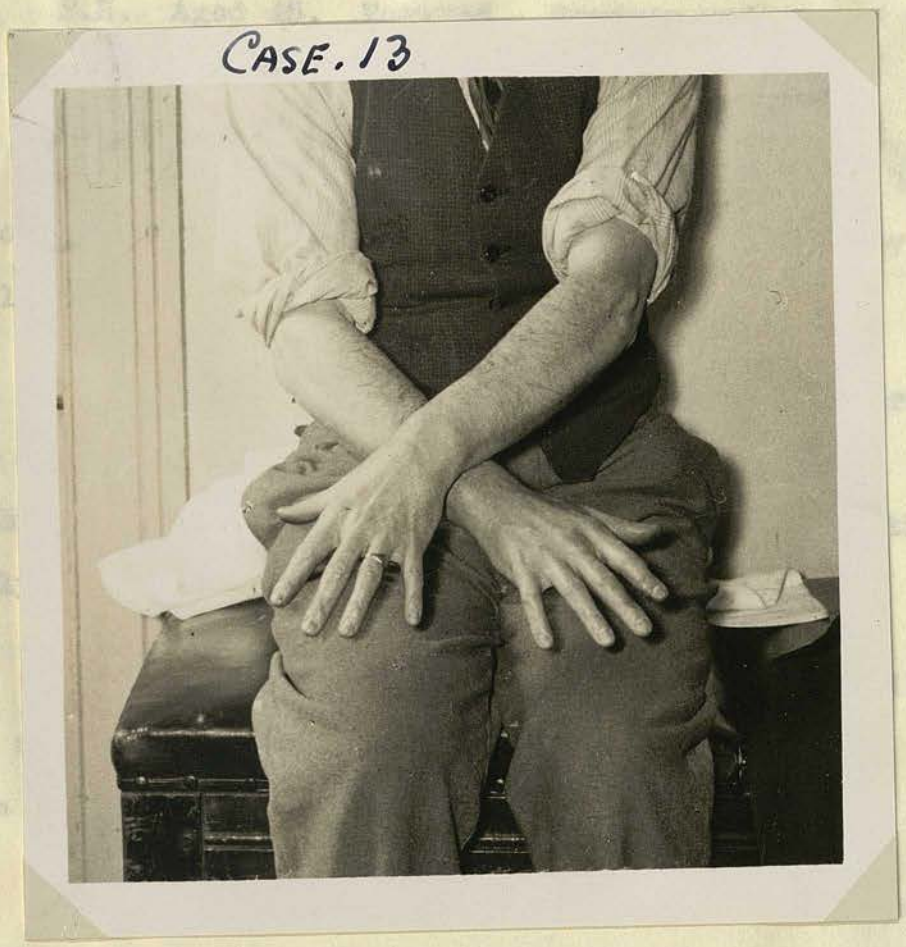
History of Present Illness. The patient states that he had what was thought to be rheumatism when he was 14 and again when he was 21, when he had pain and swelling in most of his joints. This all disappeared shortly after and reappeared last year when all his joints became stiff and swollen. He was admitted almost immediately to Llandrindod Wells Hospital and remained for three weeks' treatment. He had electrical baths, gentle massage, and injections. His teeth have always been good and appear to be healthy now. He has lately had much trouble with his throat which is more or less constantly sore and dry. The tonsils were supposed to

have been removed when he was a child but are probably not completely eradicated.

Present Condition. Healthy looking man with good colour and well nourished. Muscles in good tone. The heart and muscles are normal.

Condition of Joints. All his joints are stiff. Slight fusiform swelling in the phalangeal joints. See photograph, Case 13. He is unable to close the fist about 75%. The wrist joints are stiff but there is no limitation of movement. The shoulder, elbow, and knee joints are not swollen but are stiff. The ankle joints are not swollen, but very stiff, after sitting down or lying down for a time.

Comments. Hospital treatment given early probably cut the attack short, although it is evident that there is some focal centre somewhere still. He is, through the British Legion, to have a further course of treatment at Hospital shortly.




CASE 13.

CASE 14.

F.H. Aged 45. Married. Roadman undergound in pit.

Complaint. Tingling sensations in arms and legs followed by stiffness in all his joints and later by swelling and pain.

Family History. His father suffered for years from chronic rheumatism and died at the age of 76. One brother suffered from rheumatism. The rest of the family appear to be healthy.

Past Illnessnes. About 19 years he had an illness similar to the present one and was ill for six weeks.

Present Condition. At the beginning of February of this year he was working in his garden, when he had a sudden severe shivering fit. Previous to this he has for some time been feeling stiffness in all his joints with tingling sensations in his fingers and arms. The day after the shivering fit, all the joints were more or less swollen and painful. His temperature was never more than 101°F. and kept up for about three days. The pulse rate was about 120 and remained round about this for some time after the temperature became normal. The

swelling in the joints subsided but the stiffness and pain remained. They are still stiff and painful after a month. There is some pyorrhoea in the teeth of the lower jaw, but the tonsils and post nares seem quite healthy. He is against having them extracted although a Surgeon Dentist has advised him to have them out without delay. I have advised him to go into hospital but this he will not do at present. He means to get back to work at the earliest possible moment for fear that he will lose his work, as well as the fact that he has a wife who is delicate (enlarged spleen) and children dependent on him. There is no way of helping him at present and he feels he must take the risk.

CASE 15.

S.A.H. Aged 44. No occupation. Married.

Complaint. Much swelling and pain in the left knee.

Family History. The relatives on both sides seem all to be healthy.

History of Past Illnesses. She has never had any illness until now.

History of Present Illness. About a fortnight before Christmas, 1935 she felt stiffness in her shoulders and arms followed by a sudden swelling in her left knee joint, shortly after, with severe pain. There was only a slight temperature for three or four days and with rest and hot fomentations the pain subsided. The swelling also subsided a little but has remained for some time as seen in the photograph, Case 15. She has pain only on moving the knee. She has some stiffness in the joints of the hands but no swelling.

Present Condition. She is a stout healthy looking woman, and is very deaf. There is no anaemia, but she suffers much from constipation. Her teeth are very bad with pyorrhoea present. The left knee is very

swollen. It can be flexed and extended with a little difficulty. The other joints appear normal.

Comments by Dr. Garfield Evans, Radiologist, Cardiff. X-Ray examination of the left knee shows some erosion of the articular surface of the inner tuberosity of the tibia, also on the inner side of the knee joint some early osteophytic outgrowths can be seen. You will note that the joint space on the inner side of the knee is diminished. This is due to disappearance of the articular cartilage. The capsule of the knee joint is also thickened.


CASE 15.

CASE 15. (Left knee.)

CASE 15. (Left knee)

CASE 16.

S.D. Aged 40. Married. No occupation.

Complaint. Stiffness in practically all her joints and occasional pain, and of partial crippling of the right leg which makes her unable to walk normally.

Family History. The patient says that her father was laid up during the latter part of his life for short periods suffering from chronic rheumatism. All the rest of the family on both sides appear to have been normally healthy people.

History of Past Illnesses. She has always been healthy up to the beginning of the present illness.

History of Present Illness. About seventeen years ago when she was pregnant on her first child, all the joints became stiff and painful. The hands were closed, the arms flexed, the shoulders drawn in, the neck stiff and painful, the hip, knee and ankle joints all in a similar conditon. At first the condition was very painful and distressing, but the pain gradually got a little less but the sort of "crumpled up" condition remained for nearly three years. She could not account for the sudden onset as her teeth and throat were always perfectly healthy. The baby was

born normally. It was small and delicate but is alive to-day. Shortly after the first confinement she was sent to the Cardiff Royal Infirmary where she was treated by the Gynecologist. This made no difference one way or the other and she was more or less crippled and bedridden for three years. She had a second child ten hears after the first. While carrying this child she was attending the Gynecological Clinic at the Cardiff Royal Infirmary every month and was confined in the Maternity Wards. For a further two or three years she was practically bedridden and then was admitted to Llandrindod Wells Hospital, where she was for six weeks. She says that then she was treated with vaccines and also with electric baths, radiant heat, and sun ray. She was discharged feeling much less stiff and her general condition much improved although still unable to walk. She has been admitted for varying periods each year and has gradually improved to be able to walk about freely with the aid of sticks.

Present Condition. Frail healthy complexioned little woman. There is no anaemia and she is fairly well nourished. The muscles have recovered much of their tone by the massage she receives every day. Brownish pigmentation is shown over the abdominal wall and on thighs. She has always been more or less troubled

with constipation. The skin is dry and the joints have a glazed appearance especially the fingers and the knees.

Condition of Joints. The finger joints have a typical fusiform swollen appearance. They are freely moveable and not deformed. The wrists although they are not deformed swollen or enlarged are completely ankylosed. The elbow and shoulder joints are not enlarged or swollen but are stiff and gratings are distinctly heard and felt. Her neck is stiff and the lateral movements are limited. When she turns her head to one side she has to turn the body as well. She is unable to keep the head up normally. The back is somewhat stiff probably due to the fact that the right hip joint is permanently semi-flexed and when she walks she has to stoop in conformity with this joint. The right hip joint although not swollen and not enlarged is very stiff and has limited movements. It is also partially flexed. The left hip appears to be normal but the movements are limited and stiff. Both knees are chronically enlarged especially the right one which remains in a slightly flexed position. Both ankle joints are freely moveable. Nails are not brittle.

Comments. The cause in this case is very obscure. Throat, nose, teeth were all healthy. Whether the

pregnancy lowered the vitality or not is not known, but the pregnancy evidently made some focus flare up to cause so acute and sudden symptoms. She was under my care until the child was born and all the treatment that could be given at the time was that which could be given in a tiny miner's cottage - nourishing diet, cod liver oil, warmth, and sedatives. No hospital at the time was available for her in her condition except the Poor Law Infirmary which she would not enter. Shortly after, she left the district and I did not see her again until about six or seven years ago when she was completely crippled. It was then, that she was admitted to Llandrindod Wells Hospital and was treated as already described. The fusiform swelling of joints in the fingers and the condition of the knees is much the same as depicted in the photograph of Case 3.

Comments by

Dr. Garfield Evans, Cardiff

the Radiologist who prepared the X-Ray films

These are interesting cases of poly-arthritis of the rheumatoid or infective variety. The general radiological changes in all these cases are erosion of articular cartilages and general rarefaction of bone. It is characteristic of this type of infective arthritis that no new bone formation occurs in the region of the joint as in osteo-arthritis which is a degenerative joint lesion. The radiological changes in infective arthritis are therefore slight and in early cases hardly noticeable. I believe that the most early change is that of rarefaction of bone beneath the articular cartilages which are therefore inefficiently supported. The typical radiological finding in this case of rheumatoid or infective arthritis is that of diminution of the joint spaces and this is due to erosion and disappearance of the articular cartilage. In the more chronic cases there appears some degree of osteo-phytic bone formation which is probably due to some secondary change. It is evident from the radiological changes in rheumatoid arthritis that the joint should be given complete rest and protected as much as possible from any kind of traumatism or any weight bearing. The

general rarefaction of bone in these cases which is more than can be put down to general disuse must point to a general infective process which I am sorry to say is often undetected. In a great number of these cases the special focus cannot be detected and one feels that most probably the infective or toxic process has its origin in the intestinal tract.

## TREATMENT

The treatment now to be described for these cases is as near the ideal treatment as can be had, but how little of it can be carried out in such cases as I have described under the circumstances in which they live. When the disease commences, in most cases they cannot remain in bed any longer than they can help. The women are compelled to get about the best way they can to do their domestic duties and the men must work to feed and clothe their wives and children and themselves. A few are more fortunate than others but the majority must depend on the goodness of the neighbours. The most that can be done for them is to assist them to get good nourishing food and cod liver oil and such like, as well as the occasional nursing that a District Nurse can give them. When they reach the stage when they become bedridden, the hospital accommodation is so limited that months pass before they even get a chance of admission and then they can only remain for treatment for short periods. In spite of all these drawbacks it is wonderful how they do improve and are able to carry on better than they did before. It may be said why does not the general practitioner use vaccines? It is a

difficult problem even to get them to conform to the simple remedies of diet and hygiene. To get them to have their bad teeth extracted is difficult even when it is explained to them the urgent necessity of having this done. Only in hospital is there any hope that vaccine treatment or any other special treatment will accomplish anything of benefit. True there are Clinics but they are few and far between and even here the patients are not under complete medical control which is necessary. Not until the Ministry of Health or some other authority increases hospital accommodation or means of treatment at a Spa, can this disease be possibly eradicated. I have attached photographs of the types of houses and streets that many of these cases presented have lived in all their lifetime. Although much has been done in building new and more suitable houses, for years these old houses have been the houses of the working class in industrial areas. Consequently what treatment I have been able to give has been anything but ideal, yet the best under the circumstances.

No specific remedy has been found but the variety of treatment and the number of drugs that at one time or another have been tried is legion. Nevertheless much good can be done to the patient and much suffering relieved, if appropriate treatment is persevered with.

The perseverence of treatment cannot be too strongly emphasised, as a disease like this, which has probably been affecting the patient for months or years cannot be eliminated in a few weeks. In old standing cases where the joints have been affected for some time, irreparable damage will have been done, but it may still be possible to alleviate the symptoms and retard the disease.

The treatment can be best considered under several headings.

1. Diet, Hygiene, Climate, Rest and Exercise.

In the first stages we are faced with the problem of a patient who complains of fleeting pains in the limbs, transient swelling of one or more joints, depresion, irritability, sleeplessness, loss of appetite and weight. Bearing in mind that endocrine and metabolic changes may be taking place the treatment should be as follows.

Change of residence should be recommended where possible as these patients are susceptible to variation of atmospheric humidity and temperature, owing probably to imperfect regulatory mechanism of body heat and skin circulation. Preference should be given to localities situated at least three hundred feet above sea level in which the soil allows of good drainage and where the rainfall is relatively low. In the spring and summer

months such places as Hindhead and Tunbridge Wells are to be recommended. In the winter months the South Coast is best probably on account of warmth and sunshine. If the patient can afford it the dry air of Egypt, Morocco and such like places are to be recommended.

In diet definite improvement appears to result from abstinence from sugar, bread, potatoes and pastries. A bulky diet of small nutritive value should be enjoined in the early stages such as fresh fruit, green vegetables and tomatoes. Fish, chicken, eggs, bacon, ham, salad oil, cod liver oil, and red meat may be added. Fluid should be taken in fairly large quantities before meals and at bedtime. No rule can be laid down with regard to stimulants. No doubt in some cases a small quantity per diem may prove beneficial and aid appetite or digestion. Meals should be given at regular intervals.

The general hygiene of the patient should not be neglected. Clothing should be light and warm, woollen garments next the skin are preferable. The feet should be kept warm and free from damp and cold. Rest is absolutely necessary in the acute and painful stages but later a moderate amount of exercise is of advantage.

2. Balneotherapy: Massage and Exercise.

These methods aim at effecting an improvement in the peripheral circulation which increases the functional

activity of the skin in such matters as excretion of waste products.

Spa Treatment offers various advantages over that which may be carried out at home, hospital or clinic. In the first place the entire activities of the patient are under control and thus the nature and the quality of the diet, the amount of exercise, amusement and sleep are controlled. It is most suitable for the first and third stages of the disease. Drinking of large quantities of water at these resorts is often beneficial not so much from the inherent virtues of the contained chemicals in the water but rather on account of the increased elimination of various waste products. A striking reduction of intestinal bacteria is produced and is probably in part responsible for the betterment in health that takes place. They should be taken not later than half an hour before meals so that they may pass through the small intestine with great rapidity and not to interfere with the gastric digestion. Various baths used are of advantage such as Radiant Heat, Foam baths, Turkish baths, which should be under medical control, hot wet packs and possibly Pistany mud baths, which is obtained from the hot sulphur springs in Czecho-Slovakia.

Massage should not be used much in the early

stages of the disease.

Heliotherapy. It is particularly in the early stages of the disease that Rheumatoid Arthritis benefits by the careful exposure of skin to the action of the sun's rays. The natural sun is much more preferable to that produced by artificial means. The difference is largely due to the fact that the natural heliotherapy is combined with the exposure of the body surface to the effect of fresh air in movement. The treatment should be commenced in the warm months and the patient gradually exposed to early morning sunshine. The first exposure should be confined to the legs, but very soon the whole body can be exposed. The times of exposure and the extent of the body to be treated depend upon the general condition and the local and constitutional reaction. It is always wise to err on the cautious side when commencing the treatment. On sunless days the skin should still be exposed to the fresh air but for twice the period when exposed to the sun. If possible the air baths should be continued throughout the winter. The patient should be urged to wear the same light garments in the winter, only adopting overcoats or wraps if their occupation entails comparative immobility out of doors.

3. Medical Treatment.

This is mostly symptomatic in the early stages,

sleeplessness, loss of weight, and pain are the symptoms that require drug treatment. For lack of sleep a mild hypnotic is considered best such as "Allonal" which produces a refreshing sleep without leaving headache or depression on waking. There are, of course, many other well tried sedatives and the choice must be left to the physician in charge of the case. In giving these drugs the risk of producing drug addiction is infinitely less than that of ruining the patient's chances of recovery by withholding them or giving them in futile doses. Opium and its derivatives should never be used and are really never required.

Recovery of weight may be gained by the use of cod liver oil in various forms.

Pain is never severe enough to demand treatment. An antipyretic is all that is required usually.

Iodine may reasonably be given to patients who exhibit symptoms of hyperthyroidism. A good preparation is Liquor Iodi Simplex, B.P. 1932, which contains 9% of Iodine. It should be given in 5ℿ doses twice daily in fresh milk. Every day the amount should be raised by 1ℿ per dose until 60ℿ per day are being consumed. If there are any signs of iodism the treatment should be discontinued. This treatment should not be continued for longer than 6 weeks.

Sulphur. Next to iodine this is the drug most extensively used but it is doubtful that it is of much use except as a laxative and a disinfectant of the bowel.

Those who believe that there is disturbed sugar metabolism have suggested treatment with Insulin and Glucose. The results do not appear to justify this kind of treatment.

Protein Shock Therapy. The intravenous injection of foreign protein in various forms such as Witte's peptone[3] milk and especially T.A.B. Vaccine, so as to produce a relatively severe reaction has been employed with some success, at any rater for a time, in this disease. Draper[14] suggests that the good effects of the domestic remedy, bees' stings, in Rheumatoid Arthritis are due to protein therapy.

4. Removal of the Septic Foci and General Treatment.

Treatment in every case should include a careful search for some local focus of infection or toxic absorption and once found, every attempt should be made to eliminate it. The mouth and nasopharynx must be thoroughly examined for sources of infection, such as diseased teeth, pyorrhoea, infected tonsils and discharging nasal sinuses. If these are found, appropriate treatment must be given. A thorough examination of the whole

body must be made and special attention paid to uterine disorders. The faeces and urine should be examined bacteriologically. If evidence of septic infection is obtained from any of these sources then if possible an autogenous vaccine should be prepared and given. The utmost care must be taken to ensure oneself that focal sepsis exists before proceeding to the removal of a suspected portion of the body. The patient should be warned that the extraction may be followed by a temporary aggravation of the arthritis, general infection may result. Whether or no the affected teeth should all be removed at one sitting or extracted in relays should be decided in each case by a consideration of the patient's condition and to some extent by the number of the teeth affected. Leucopenia has been regarded as a sign of diminished resistance[48] and an indication that not more than one tooth should be removed at a time. Removal of dead teeth pulps requires careful consideration as dead pulps favour persistence of infection and so arthritis. Izod Bennett[8] emphasises the responsibility in this respect of dental surgeons who kill sensitive pulps for the relief of pain. Curetting of an infected uterus is dangerous as it has been known to spread the infection.

Vaccine Treatment. When first mooted it was found to be a very uncertain remedy. Crowe[12] has worked at the

subject for twenty years and come to the conclusion that it is a most powerful remedy. He by experiments discovered that there are a number of different streptococci which seem to be able to produce rheumatism and that these were quite distinct serologically. Serologically distinct strains of otherwise identical organisms are called types. This is of importance for if the serum of say type one is injected into a patient who is suffering from the effects of a type two the result is nil whereas if the serum of type two had been injected a cure usually results. In rheumatism after a number of agglutination experiments had been made, it was found that most patients were infected not by one streptococcus alone or even two but usually by two or three, or more.

It is essential, therefore, that in order to treat rheumatism successfully all the rheumatic streptococci as far as they are known should be combined in the vaccine used. More especially is this true of a stock vaccine, but it is also true that even when autogenous vaccines are used these should be combined with stock vaccines since streptococci are very easy to miss. Crowe maintains that it frequently occurs when using autogenous vaccine alone that many cases showed early improvement but this was followed by relapse. In these cases the vaccine seemed to have no further effect and he has little doubt

that this experience is really due to the fact that different streptococci which had probably been present all along but had not been found were keeping up the infective process. The next step was to collect all the possible rheumatic streptococci, and make them into a stock vaccine. When this was done and always combined with the autogenous vaccine in every case, relapses were then far less frequent. Thus in the first stage autogenous vaccines were fairly successful. In the second stage autogenous vaccines plus stock vaccines were successful in far more cases and with many less relapses. Now in his experiments he has come to the third stage which is an attempt in a rheumatism clinic to treat large numbers of patients with stock vaccines. The result has been very gratifying and he believes that the time is not far distant when autogenous vaccines will not be necessary, save in a small proportion of cases. He states that the rule of treatment is not difficult and should be able to be carried out by the general practitioner, in his own surgery. It consists in giving the patient an injection once a week for a long period and in most cases the dosage can be governed practically by rule of thumb. He contends that there are three main reasons why the medical profession generally have not been successful in vaccine treatment. First, that the

vaccines which are used and are marketed by commercial firms, are not sufficiently polyvalent to be specific in more than a very small proportion of cases. Second, that the dosage of the vaccines usually given is far too high, and third that staphylococci are just as frequently involved in rheumatism and similar diseases as are streptococci. The reason for this is not far to seek, because as Almroth Wright pointed out some years ago there are two types of organisms which can grow quite readily in human blood. These are streptococci and staphylococci. Since both these micro-organisms are normal inhabitants respectively of the mucous membrane and skin, should one of these microbes break down the natural defences it would be almost peculiar if the other type did not do the same. Thus Crowe uses in all cases in his vaccine both the streptococci and the staphylococci. To this he attributes his success in vaccine treatment. He describes as a causal agent Staphyloccus epidermis albus (variety deformans) which he called Micrococcus deformans and which he uses in all his cases.

General Treatment. The chief disorder affecting the digestive system is as already stated constipation and this is best treated by lavage of the large bowel, massage, exercise, suitable diet, and the use of laxatives. Anaemia is frequently met with and

must be treated by the use of iron tonics, meat extracts and other appropriate measures. The general health of the patient must be maintained at the highest level.

During the Second Stage of the Disease. When the patient is usually bedridden with swollen painful joints, wasted muscles, pyrexial attacks, separated at intervals, of subnormal temperatures and when sleep is disturbed by muscular twitchings, wrenching the sensitive joints, preventive measures are required as the danger of contracture and deformity is to be remembered. Splints must be resorted to if the appalling contractures are to be avoided. Although great relief from pain is derived from immobilisation, gentle passive movements must be used even in the acute stages to prevent sever muscular atrophy and shortening. Abdominal and respiratory exercises should be practised. Radiant heat and diathermy are of undoubted value at this stage.

During the Third or Later Stage of the Disease. Crippling has taken place. Iron tonics are given. Pain should be prevented to enable the patient to do exercises by giving four grains of aspirin and amidopyrin three or four times a day. Muscular contractions should be practised daily and manipulation of joints as

far as is possible. It is unnecessary to wait until the knees have been restored to full movement before the patient is induced to walk. A suitable ambulatory splint can be used in the beginning.

5. Surgical Treatment.

This is only resorted to in cases where there is true bony ankylosis or where there is very rigid fibrous union which has failed to respond to treatment by extension. At present operation is not very satisfactory and seldom is function restored to the ankylosed joint.

As many of the cases presented have been treated once or more at Llandrindod Wells Hospital, Dr. John Murray, the Medical Superintendent, has been kind enough to give me a short resumé of the treatment given there.

> "The only routine treatment which I adopt is elimination of waste products by the waters (Saline and Sulphur) acting on bowels and kidneys and baths with Radiant Heat or Hot Sulphur Water Baths to act on the skin. Apart from that all other treatments are selective. Sources of possible infection are searched for in teeth, tonsils, nasal passages, bowel and bladder and are dealt with according to their locality. Where there is stiffness but no pain Vichy Douche, massage baths, Radiant Heat followed by dry massage, diathermy, ionization with any of the usual drugs or with I.C.P. (Trichlorophenyl-methyliodsalicyl) which I think well of, the Tynaurer hot air local applications (electricity passed through dry pads). Injections. Autogenous vaccines when the bug is found or stock vaccines of mixed streptococci and staphylococci. Warren

Crowe's method has been used very successfully but must be pursued with great accuracy on the patient's part and over a long period. Iodolysin in 15/30m intramuscularly and Protean Shock by means of 5% Sol. Peptone all enter into the picture. Climacteric cases are treated with Ovarian extracts and in the obese thyroid is given. Rest when there is pain, massage and movements when pain has subsided and stiffness remains."

## SUMMARY AND CONCLUSIONS

1. Much investigation - long and searching - is still required to differentiate the causes and progress of all the different kinds of Arthritis, to allow of better treatment.

2. A much more personal medical supervision of the patients at the early stages is required. This may be done at home among the better class patients, but is next to impossible among the working class.

3. For the benefit of the working class better provision for Hospital and Spa treatment should be made. This is all the more necessary when their social conditions etc. are looked into:- poor houses in mean streets, very little if any nursing assistance, poor food, unemployment, refusal to accept the most modern treatment, pestered by neighbours who readily offer gratuitous advice of quack remedies.

4. In Hospital, the cases show in most cases when taken early quick amelioration of the disease, shortening the painful symptoms and in many cases completely curing them or at least preventing the dreadful crippling that is seen in so many old-standing cases.

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